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**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**ZOOLOGY (Paper – III) (2008 Pattern)**  
**ZY-333 : Biological Chemistry (New Course)**

Time : 2 Hours

Max. Marks: 40

- N.B.:** 1) *All questions are compulsory.*  
2) *Neat labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following : **10**
- 1) What is Colloid ?
  - 2) Define Bronsted Acid.
  - 3) What is Chiral carbon ?
  - 4) What are biomolecules ?
  - 5) What is a racemic mixture ?
  - 6) Define oxidative rancidity.
  - 7) What is prosthetic group ?
  - 8) Name the optically inactive amino acid.
  - 9) State two functions of calcium.
  - 10) Mention two sources of Vitamin C.
2. Attempt **any two** of the following : **10**
- i) What are carbohydrates ? Explain their biological significance.
  - ii) Explain the clinical significance of enzymes.
  - iii) Explain the various forces stabilizing the tertiary structure of proteins.
3. Write notes on **any two** : **10**
- a) Effect of substrate concentration on enzyme activity.
  - b) Stereoisomerism in carbohydrates.
  - c) Biological buffer system.
  - d) Formal titration.
4. What are lipids ? Classify them with suitable examples and add a note on saponification. **10**

OR

Explain the occurrence, biological functions and deficiencies of Vitamin B<sub>6</sub> and Vitamin E. **10**



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**Paper – VII : MATHEMATICS (2008 - Pattern) (New)**  
**MT-337 (Elective – F) : Number Theory**

Time : 2 Hours

Max. Marks : 40

*Note: 1) All questions are compulsory.*  
*2) Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

i) If  $x$  and  $y$  are odd integers, prove that  $x^2 + y^2$  is even but not divisible by 4.

ii) If  $(n, 7) = 1$ , then prove that  $n^{12} - 1$  is divisible by 7.

iii) Write down a reduced residue system modulo 8, composed entirely of multiples of 3.

iv) If  $x$  is real number and  $m$  is a positive integer, then prove that  $\left[ \left[ \frac{x}{m} \right] \right] = \left[ \frac{x}{m} \right]$ .

v) For  $n = 400$ , find  $\phi(n)$  and  $\sigma(n)$ .

vi) Find the value of  $\left( \frac{20}{17} \right)$ .

vii) Find two Pythagorean triples whose terms form an arithmetic progression.

2. Attempt **any two** of the following : **10**

i) Let  $P$  denote a prime. Then prove that the largest exponent  $e$  such that  $P^e | n!$  is

$$e = \sum_{i=1}^{\infty} \left[ \frac{n}{P^i} \right].$$

ii) Solve the system of linear congruences  $x \equiv 3 \pmod{11}$ ,  $x \equiv 5 \pmod{19}$ ,  
 $x \equiv 10 \pmod{29}$ .

iii) Prove that an integer is divisible by 3 if and only if the sum of its digits is divisible by 3.

**P.T.O.**



3. Attempt **any two** of the following :

**10**

- i) Let  $p$  be an odd prime and  $(a, p) = 1$ . Then prove that  $\left(\frac{a}{p}\right) \equiv a^{(p-1)/2} \pmod{p}$ .
- ii) By using Euclidean Algorithm, find the g.c.d. 'd' of the numbers 2947 and 3997. Also find integers  $x$  and  $y$  satisfying  $d = 2947x + 3997y$ .
- iii) Apply Wilson's theorem to show that
  - a)  $18! + 1 \equiv 0 \pmod{19}$
  - b)  $18! + 1 \equiv 0 \pmod{23}$ .

4. Attempt **any one** of the following :

- i) a) Prove that for any integers  $a$  and  $b$  with  $a > 0$ , there exist unique integers  $q, r$  such that  $b = aq + r$ ,  $0 \leq r < a$ . **6**
- b) Find all solutions of  $3x + 5y = 1$ . **4**
- ii) a) A cock worth Rs. 5, a hen Re. 1. and four chickens together Re. 1. How many cocks, hens and chickens, totaling 100, can be bought for Rs. 100. **6**
- b) Prove that for any given positive integer  $k$ , there exist  $k$  consecutive composite integers. **4**



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**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**PHYSICS (Paper – III) (New) (2008 Pattern)**  
**PH – 333 : Classical Mechanics**

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of logtables and calculators is allowed.*

1. Attempt **all** of the following (**1** mark **each**) : **10**
- a) What is the limitation of a single stage rocket ?
  - b) What do you mean by ‘centre of mass’ of a system ?
  - c) What is meant by ‘apsidal distance’ ?
  - d) Define ‘central force’. Give one example of central force.
  - e) What is the outcome of Rutherford’s experiment of scattering of  $\alpha$ -particles by a thin gold foil ?
  - f) Draw the diagram showing collision process in LAB system.
  - g) State D’Alembert’s principle.
  - h) Write the Hamiltons canonical equations of motion.
  - i) What is meant by non-inertial frame of reference ?
  - j) Give one example of fictitious force.
2. Attempt **any two** of the following :
- a) Obtain the equations of height and range of the projectile in a non-resistive medium. **5**
  - b) Derive differential equation of orbit from the equation of motion of a particle subjected to central force. **5**
  - c) What are constraints ? Give the classification of constraints with suitable examples. **5**

**P.T.O.**



3. Solve **any two** of the following :

a) A rocket engine of mass  $3 \times 10^5$  kg having fuel of mass  $2 \times 10^5$  kg ejects exhaust gases with a velocity of 3000 m/s at a rate of  $10^4$  kg/s. Calculate the maximum vertical velocity attained by the rocket. **5**

b) Calculate the fictitious force and the total force acting on a freely falling body of mass 7 kg with reference to a frame moving vertically downwards on earth with an acceleration of  $3 \text{ m/s}^2$ . **5**

c) Calculate the height of geosynchronous satellite above the earth's surface.  
Given : Mass of earth =  $6 \times 10^{24}$  kg,  $G = 6.67 \times 10^{-11} \text{ N-m}^2/\text{kg}^2$   
Radius of earth (R) = 6370 km, Period T = 24 hrs. **5**

4. A) Attempt **any one** of the following :

a) What is inelastic scattering ? Obtain the relation between differential cross-section and impact parameter with the help of suitable diagram. **8**

b) Give the advantage of Hamiltonian formulation over Newtonian formulation. Obtain Hamiltonian and Hamilton's equation of motion for a simple pendulum from its Lagrangian. **8**

B) Attempt **any one** of the following :

a) State and explain the principles of virtual work. **2**

b) What is coriolis force ? What is the effect of coriolis force on the moving particle in northern hemisphere ? **2**

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VIII)**  
**DS-338(A) : Armed Conflicts and Human Rights (Optional)**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B. : i) All questions are compulsory.*  
*ii) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) Define 'Human Rights'.
  - 2) Define 'Humanitarian Law'.
  - 3) Define 'Non-combatant'.
  - 4) What is meant by POW ?
  - 5) Why medical installations are protected from attack ?
  - 6) Introduce Humanitarian practices.
  - 7) What is Armed conflict ?
  - 8) What is ABC weapons ?
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Explain the concept of Military target.
  - 2) Write the scope of Humanitarian studies.
  - 3) What are the prohibited methods of warfare ?
3. Write short notes on (**any two**) : **8**
  - 1) Legal condition of war.
  - 2) Protection of civilian population.
  - 3) Care of sick and wounded soldiers.
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Establish relationship among International Relations, Democracy and Human Rights.
  - 2) Discuss the laws of Naval warfare.

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P.T.O.



**T.Y. B.Sc. (Semester – III) Examination, 2010**

**DEFENCE AND STRATEGIC STUDIES**

**DS-338(B) : International Organisations and National Security (New)**

Time : 2 Hours

Max. Marks : 40

*N.B. : i) All questions are compulsory.  
ii) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
    - 1) Introduce league of Nations.
    - 2) Introduce United Nations.
    - 3) What is Secretariate ?
    - 4) What do you mean by peace keeping ?
    - 5) Write the significance of ECOSOC.
    - 6) Define 'National Security'.
    - 7) Define 'Peace'.
    - 8) Define 'Terrorism'.
  
  2. Answer in **8 to 10** sentences (**any two**) : **8**
    - 1) Write the concept of international organisation.
    - 2) Write the history of international organisations.
    - 3) How League of Nations was created ?
  
  3. Write short notes on (**any two**) : **8**
    - 1) General Assembly of UN
    - 2) Security Council of UN
    - 3) Trusteeship Council of UN.
  
  4. Answer in **16 to 20** sentences (**any one**) : **8**
    - 1) Write the role of United Nations in International Peace and Security.
    - 2) Why League of Nations failed in its objectives ? Explain.
-



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES**  
**DS-338(C) : International Law (Optional) (New)**

Time : 2 Hours

Max. Marks : 40

*N.B. : i) All questions are compulsory.*  
*ii) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) Define 'Sovereign State'.
  - 2) Introduce 'Hague Convention'.
  - 3) Introduce 'Geneva Conventions'.
  - 4) Define 'Nuclear Warfare'.
  - 5) Define 'Chemical Warfare'.
  - 6) What is 'International Treaty' ?
  - 7) What is 'Peace Keeping' ?
  - 8) Define 'Human Rights'.
  
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Discuss the historical development of international law.
  - 2) Explain the scope of international law.
  - 3) What are the sources of International law ?
  
3. Write short notes on (**any two**) : **8**
  - 1) U.N. Charter on war.
  - 2) Universal Declaration of I.H.R.
  - 3) Diplomatic procedure.
  
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Discuss the legal nature of war.
  - 2) Discuss the principles to regulate the conduct of war that emerged out of Hague Conventions.





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**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**PHYSICS (Paper – VI) (New) Elective – I**  
**PH – 336 (A) : Astronomy and Astrophysics – I**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*  
iii) *Draw neat diagram wherever necessary.*

1. Attempt **all** of the following (**1 mark each**) : **10**
- a) State Wien's law.
  - b) Distinguish between magnification and resolution of the telescope.
  - c) Explain the term Parsec.
  - d) What are extra-solar planets ?
  - e) Explain the 'steady state theory'.
  - f) What are Pulsars ?
  - g) What is meant by stellar parallax ?
  - h) What are binaries ?
  - i) What is meant by 'variable stars' ?
  - j) Calculate the distance of 'Uranus' in A. U. using Bode's law.
2. Attempt **any two** :
- a) Describe the various photospheric phenomenon occurring on the solar surface. **5**
  - b) Describe 'Butterfly diagram' **5**
  - c) What is 'Dark matter' and 'Dark energy' ? **5**

**P.T.O.**



3. Attempt **any two** :

- a) Write a short note on 'Radio Telescope'. 5
- b) Distinguish between apparent and absolute magnitudes. 5
- c) Write a short note on 'Quasars'. 5

4. A) Attempt **any one** :

- i) Explain the working of CCD camera in details. 8
- ii) Write a short note on non-optical Astronomy. 8

B) Attempt **any one** :

- i) Which optical filters are commonly used in photometry ? 2
  - ii) The  $\lambda_{\max}$  of a star is  $6800 \text{ \AA}$ , what is its surface temperature ? 2
-



**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**PHYSICS (Paper – VI) (New) Elective – I**  
**PH – 336 (B) : Elements of Material Science**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagrams wherever necessary.*  
4) *Use of calculators and log tables is allowed.*

1. Attempt **all** of the following (1 mark each) : **10**
- a) Define dielectric strength of a material.
  - b) What is elastic strain in a copper rod that is stressed 70 MPa. Given modulus of elasticity of Cu = 110,000 MPa ?
  - c) What is atomic diffusion ?
  - d) State Gibb's phase rule.
  - e) What is linear polymer ?
  - f) What is Giant magnetic resonance ?
  - g) State any two factors on which diffusivity depends.
  - h) Define the term creep.
  - i) What do you mean by elastic deformation ?
  - j) State thermal properties of material.
2. Attempt **any two** of the following :
- a) Give comparison between addition and condensation polymerization. **5**
  - b) Explain the line defects. **5**
  - c) Define critical resolved shear stress (CRSS) and obtain Schmid's law. **5**



3. Attempt **any two** of the following :

- a) Discuss Zns-type Ax structures. 5
- b) An activation energy of 2.0 eV (or  $0.32 \times 10^{-18}$ ) is required to form a vacancy in a metal. At 800°C there is one vacancy for every  $10^4$  atoms. At what temperature will there be one vacancy for every 1000 atoms ? 5
- c) A FCC crystal has a CRSS of  $0.7 \text{ MN/m}^2$ . What tensile stress must be applied along the [100] of the crystal to initiate plastic deformation ? 5

4. A) Attempt **any one** of the following :

- a) State importance and objectives of phase diagram. Draw phase diagram for Lead-tin system. Explain the different areas in it. 8
- b) State and explain magnetic properties of ceramic phases. 8

B) Attempt **any one** of the following :

- a) A 50 mm gauge length is marked on a copper rod. The rod is strained so that the gauge marks are 59 mm apart calculate strain. 2
  - b) State electrical properties of ceramic phases. 2
-



**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**PHYSICS (Paper – VI) Elective – I (New)**  
**PH – 336 (C) : Motion Picture Physics – I**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B:* 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagrams wherever necessary.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) State various types of filters.
  - b) State factors affecting in developing process. (B/W)
  - c) State printing methods. (colour)
  - d) State any two laboratory special effects.
  - e) Which lenses are used for wide screen ?
  - f) How optical recording takes place ?
  - g) What is the use of projection lens ?
  - h) What is aperature ?
  - i) State use of filters in camera.
  - j) State two printing techniques.
2. Attempt **any two** of the following :
- a) Explain eight sources and their characteristics. **5**
  - b) Explain projector and its essential parts. **5**
  - c) How the following laboratory special effects are added : **5**
    - 1) Slow motion.
    - 2) Reverse action.



3. Attempt **any two** of the following :

- a) Explain intermittent mechanism of movie camera. 5
- b) Draw neat labelled diagram of T. L. R. camera. Explain two aberrations in lens. 5
- c) Explain stages involved in processing B/W printing. State factors affecting in developing process (B/W) 5

4. A) Attempt **any one** of the following :

- a) State essential parts of movie camera. What is the use of shutter and view finders in movie camera ? 8
- b) Explain construction of projector. Explain drive mechanism in projector. 8

B) Attempt **any one** of the following :

- a) What is the use of projection lens and projection screen ? 2
  - b) What is the composition of colour reversal film ? 2
-



**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**PHYSICS (Paper – VI) Elective – I (New)**  
**PH – 336 (D) : Biophysics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagram wherever necessary.*

1. Attempt **all** of the following : **10**
- a) What do you mean by NMR ?
  - b) State principle of centrifuge.
  - c) What is full form ECG and EEG ?
  - d) State different colours used for ECG leads.
  - e) Define free energy.
  - f) Define resting potential.
  - g) State any two names of amino acids.
  - h) Mention different chemical component of DNA.
  - i) State any one role of protein in a cell.
  - j) What is bond length ?
2. Attempt **any two** of the following :
- a) Explain structural aspects of mitochondria. **5**
  - b) With neat diagram explain CIS and Trans configuration. **5**
  - c) Explain construction and working of linear variable transducers. **5**



3. Attempt **any two** of the following :
- a) Explain construction and working of glass electrode. 5
  - b) With neat diagram explain working of calorimeter. 5
  - c) Explain nuclear detector. 5
4. A) Attempt **any one** of the following :
- a) With block diagram explain working of ECG machine. 8
  - b) Explain fibrous structure of protein. 8
- B) Attempt **any one** of the following :
- a) What is resting potential ? 2
  - b) State nerst equation. 2
-





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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**ZOOLOGY (PAPER – V)**  
**Zy – 335 (a) : General Pathology (New Course)**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks : 40

- N.B. :*** 1) ***All questions are compulsory.***  
2) ***Neat labelled diagrams must be drawn wherever necessary.***  
3) ***Figures to the right indicate full marks.***

1. Attempt the following : **10**
- 1) Define autopsy pathology.
  - 2) Define regeneration.
  - 3) What is benign tumour ?
  - 4) Enlist types of gangrene.
  - 5) In which body part rigour mortis is observed first.
  - 6) Name the causative organism of hepatitis.
  - 7) What is leukemia ?
  - 8) Mention the importance of gastric analysis.
  - 9) What is chronic inflammation ?
  - 10) Explain melanosis.
2. Attempt **any two** of the following : **10**
- i) Describe aetiology of tuberculosis.
  - ii) What is healing ? Explain types of healing.
  - iii) Describe postmortal changes.
3. Write notes on **any two** of the following : **10**
- a) Metastatic calcification.
  - b) Liver function test.
  - c) Signs (cardinals) of inflammation.
  - d) Types of necrosis (any two types).
4. What is haemorrhage ? Explain causes and effects of haemorrhage. **10**
- OR**
- What is degeneration ? Describe pathological changes and effects of cloudy degeneration. **10**

P.T.O.



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**ZY – 335 (b) : Basic Entomology (New Course)  
(2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Neat labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following : **10**
- 1) What is cornea ?
  - 2) What do you mean by hypognathous head ?
  - 3) What is apodous larva ?
  - 4) What do you mean by hemimetabola ?
  - 5) What is elytron ?
  - 6) Name any two sensory receptors in insects.
  - 7) What is primer effect pheromone ?
  - 8) Name sound producing organ in cicada.
  - 9) Which insect produces cantharidin ?
  - 10) What is pronotum ?
2. Attempt **any two** of the following : **10**
- i) Describe mouthparts of housefly.
  - ii) Explain wing venation in insect.
  - iii) Describe hormonal control of metamorphosis.
3. Write notes on **any two** of the following : **10**
- a) Structure of simple eye of insect.
  - b) Sketch and label t.s. of insect integument.
  - c) Insect as model animal in genetic studies.
  - d) Abdominal appendages in collembola.
4. What is Pheromone ? Describe various types of pheromones produced by insects. **10**

OR

Explain structure of typical leg of insect. Describe atleast four types of modifications of insect leg. **10**



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**T.Y.B.Sc. (Semester – III) Examination, 2010**

**MICROBIOLOGY (Paper – V)**

**MB – 335 : Fermentation Technology – I (New Course) (2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- N.B. :* 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labelled diagrams wherever necessary.*

1. A) Answer the following : 5

- i) Define copyright.
- ii) Define secondary metabolite.
- iii) Give an example of oxygen sensor used in monitoring of fermentation process.
- iv) Define Stokes law.
- v) Give two examples of partition chromatography.

B) Match the following : 5

**A**

**B**

- |                           |                          |
|---------------------------|--------------------------|
| 1) Thermistor             | a) Titration             |
| 2) Toxicity testing       | b) Full factorial search |
| 3) Physicochemical method | c) Ehrlenmeyer Flask     |
| 4) Media optimization     | d) Lal's test            |
| 5) Laboratory scale       | e) Temperature control   |

2. Attempt **any two** of the following : 10

- a) Describe Ames test for carcinogenicity testing of finished product.
- b) Discuss non recurring expenditure with respect to fermentation economics.
- c) Give the significance of Placket Burman design in media optimization.

**P.T.O.**



3. Attempt **any two** of the following : **10**
- a) Explain the objectives of scale up.
  - b) Describe the techniques involved in monitoring and control of pH in fermentation.
  - c) Explain the principle and working of rotary vacuum filter.
4. Attempt **any one** of the following : **10**
- a) Enlist the objectives of strain improvement programme with the help of suitable examples. Write a note on auxotrophic mutants.
  - b) Describe biological assays for quantitation of fermentation products.



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**ELECTRONIC SCIENCE (Paper – V)**  
**EL – 335 : ‘C’ Programming (New)**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- N.B. :*
- i) All questions are compulsory.*
  - ii) Neat diagrams must be draw wherever necessary.*
  - iii) Figures to the right indicate full marks.*
  - iv) Use of calculator is allowed.*

1. Answer **all** of the following :

- a) State increment and decrement operators. 1
- b) Write any two categories of user defined function. 1
- c) Write the resolution of SVGA monitor. 1
- d) State the bit size of char, int, float, double data types. 1
- e) List any two advantages of using pointers in a program. 2
- f) How the structure is declared ? 2
- g) Give 4 basic operations on a file. 2
- h) List the bitwise operators in C. 2

2. Answer **any two** of the following :

- a) Explain FOR loop statement with suitable examples. 4
- b) Write a short note on pointer operations. 4
- c) Explain fprintf ( ) and fscanf ( ) functions. 4

P.T.O.



3. Answer **any two** of the following :

- a) Define a structure called student, that will describe student's name, Roll No, and marks. Using this structure, write a program to read this information for one student from the keyboard and print the same on the screen. **4**
- b) List the types of if statement and explain any one of them with example. **4**
- c) Write a program to find sum of digits of a given integer number using function. **4**

4. Answer **any two** of the following :

- a) Explain the following Library function. **6**
  - i) scanf ( )
  - ii) putchar ( )
  - iii) isdigit ( ).
- b) State the meaning of following statements. **6**
  - i) int (\*p) (char \*a)
  - ii) int p (char \*a).
- c) Write short note on handling of **6**
  - i) Non-integer functions
  - ii) Nesting of functions.

OR

5. Answer the following :

- a) Write a program in 'C' graphics to draw triangle and ellipse. **4**
- b) Write a C program to calculate average of a set of N numbers. **4**
- c) Write a C program to find addition of two matrices, of order  $3 \times 3$ . **4**



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**ENVIRONMENTAL SCIENCES (New)**  
**Paper – III (2008 Pattern)**  
**ENV – 303 : Water Quality**

Time: 2 Hours

Max. Marks: 40

- Instructions :*
- 1) *All questions are compulsory.*
  - 2) *Neat and labeled diagrams must be drawn wherever necessary.*
  - 3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
  - a) Define Ballast Water.
  - b) Give the examples of two microbes involved in anaerobic treatment.
  - c) Explain the term epidemic diseases.
  - d) Write correct full form of RBC (in waste water treatment).
  - e) Give the name of causitive agent of typhoid.
  - f) What is surfactant ?
  - g) Give the fullform of MLSS.
  - h) What is zooglocal film ?
  - i) Define GIS.
  - j) Enlist two microbes involved in Activated Sludge process.
2. Write a short note on (**any two**) : **10**
  - a) Oxidation pond.
  - b) Physicochemical characteristics of water.
  - c) Mechanism of anaerobic treatment process.
3. Answer **any two** from the following : **10**
  - a) Explain adverse effects of oil spill.
  - b) What are the adverse effects of detergents on aquatic eco system. ?
  - c) Comment on the anthropogenic causes of ground water pollution.
4. Attempt **any one** of the following question : **10**
  - a) Comment on the aerobic waste water treatment methods.
  - b) Explain the concept of eutrophication. Elaborate causes, effects and control measures of eutrophication.



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**ENVIRONMENTAL SCIENCES (Paper – V)**  
**ENV – 305 : Environmental Governance and Equity : Laws and Ethics**  
**(New) (2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

*Instructions :* 1) *All questions are compulsory.*  
2) *Neat and labeled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
  - a) Write fullform of ‘CPCB’.
  - b) Define the term ‘Recipient System’.
  - c) What is meant by ‘Trade Effluent’ ?
  - d) Explain the term ‘Wildlife’.
  - e) What is an ‘Ecomark’ ?
  - f) Write any two principles of ‘Johannesburg Summit’.
  - g) State any two differences between ‘Science and Technology’.
  - h) Write the statement of ‘Article 48-A’.
  - i) What is an ‘Air pollution control area’ ?
  - j) What is a function of ‘Government Analyst’ ?
  
2. Write a short note on (**any two**) : **10**
  - a) Environmental ethics
  - b) Powers of Central Governement under Environment (protection) Act, 1986.
  - c) National forest policy.
  
3. Answer **any two** from the following : **10**
  - a) Elaborate the functions of Central Board constituted under water (prevention and control) Act, 1974.
  - b) Write an account on religions and their relation with environmental ethics.
  - c) Explain any ten principles of Rio declaration.
  
4. Attempt **any one** of the following question : **10**
  - a) What are the salient features of Water (prevention and control) Act, 1974.
  - b) Discuss in detail on environmental ethics and issues involved in conservational aspects.





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**T.Y. B.Sc. (Semester – III) Examinations, 2010**  
**ENVIRONMENTAL SCIENCES – (Paper – VI)**  
**ENV – 306 : Environmental Biotechnology – I**  
**(2008 Pattern) (New)**

Time: 2 Hours

Max. Marks: 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Neat and labeled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2 lines each** : **10**
- a) What are biopesticides ?
  - b) Name any 2 states producing neem products.
  - c) Define vermi composting.
  - d) Name any 2 methods for development of biofuels.
  - e) What are petroplants ? Name any one.
  - f) Give the composition of biogas.
  - g) Give the botanical name of any 2 plant species used as a source of biodiesel.
  - h) Give fullform of GMO.
  - i) Why there is a need of biofertilizers (any 2 points)
  - j) Enlist the components of soil.
2. Write a short note on (**any two**) : **10**
- a) Scope and objectives of environmental Biotechnology.
  - b) Algae as Biofuel.
  - c) Indian model of biogas plant with diagram.
3. Answer **any two** from the following : **10**
- a) How biopesticides and neem pesticides are manufactured ?
  - b) Give any 5 advantages of Biodiesel.
  - c) Describe the microbial recovery of metals by giving examples.
4. Attempt **any one** of the following questions : **10**
- a) Explain in detail composting process with respect to types of composting technology, process and factors influencing.
  - b) Describe control measures of air borne infections.



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**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**MATHEMATICS Paper – VII**  
**MT – 337 Elective (A) : Operations Research**  
**(2008 Pattern : New Course)**

Time: 2 Hours

Max. Marks: 40

*N.B. : 1) All questions are compulsory.*  
*2) Figures to the right indicate full marks.*

1. Attempt **any five** of the following :

**10**

i) Use graphical method to show that following LPP has infeasible solution space.

$$\begin{aligned} \text{Max } Z &= 3x_1 + 2x_2 \\ \text{Subject to,} \\ 2x_1 + x_2 &\leq 2 \\ 3x_1 + 4x_2 &\geq 12 \\ x_1, x_2 &\geq 0 \end{aligned}$$

ii) What is the sensitivity analysis ?

iii) Define a basic feasible solution. Determine one basic feasible solution of the following LPP.

$$\begin{aligned} \text{Max } Z &= 2x_1 - 4x_2 + 5x_3 - 6x_4 \\ \text{Subject to} \\ x_1 + 4x_2 - 2x_3 + 8x_4 &\leq 2 \\ -x_1 + 2x_2 + 3x_3 + 4x_4 &\leq 1 \\ x_1, x_2, x_3, x_4 &\geq 0 \end{aligned}$$

iv) Identify the direction of increase in  $Z$  of the function  $\text{Max } Z = x_1 - x_2$ .

v) What is the rule for recognizing an alternate optimum solution for the transportation problem ?

**P.T.O.**



vi) Write the dual of the following primal problem.

$$\text{Max } Z = 5x_1 + 6x_2$$

Subject to

$$x_1 + 2x_2 = 5$$

$$-x_1 + 5x_2 \geq 3$$

$$x_1 \text{ unrestricted and } x_2 \geq 0$$

vii) Determine the mathematical formulation of the transportation problem.

2. Attempt **any two** of the following :

**10**

i) Popeye Canning is contracted to receive 60,000 Kg. of ripe tomatoes at Rs. 7 per Kg. from which it produces both canned tomato juice and tomato paste. The canned products are packaged in 24 – can cases. A can of juice requires 1 Kg. of fresh tomatoes and a can of paste requires  $\frac{1}{3}$  Kg. only. The company's share of the market is limited to 2000 cases of juice and 6000 cases of paste. The wholesale prices per case of juice and paste are Rs. 1800 and Rs. 900 respectively. Formulate the problem as a linear program for maximum revenue.

ii) Consider the following LPP.

$$\text{Min } Z = 4x_1 + x_2$$

Subject to

$$3x_1 + x_2 = 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 4$$

$$x_1, x_2 \geq 0$$



The optimal simplex tableau at the end of phase I is given as

Basic	$x_1$	$x_2$	$x_3$	$R_1$	$R_2$	$x_4$	Solution
$r$	0	0	0	-1	-1	0	0
$x_1$	1	0	$\frac{1}{5}$	$\frac{3}{5}$	$-\frac{1}{5}$	0	$\frac{3}{5}$
$x_2$	0	1	$-\frac{3}{5}$	$-\frac{4}{5}$	$\frac{3}{5}$	0	$\frac{6}{5}$
$x_4$	0	0	1	1	-1	1	1

Using phase II, determine the optimum solution of the LPP.

iii) Solve the following LPP graphically.

$$\text{Maximize } Z = 5x_1 + 4x_2$$

Subject to

$$6x_1 + 4x_2 \leq 24$$

$$x_1 + 2x_2 \leq 6$$

$$-x_1 + x_2 \leq 1$$

$$x_2 \leq 2$$

$$x_1, x_2 \geq 0.$$

3. Attempt **any two** of the following :

10

i) Solve the following assignment problem for minimum cost.

Job	Workers				
	$W_1$	$W_2$	$W_3$	$W_4$	$W_5$
<b>A</b>	11	17	8	16	20
<b>B</b>	9	7	12	6	15
<b>C</b>	13	16	15	12	16
<b>D</b>	21	24	17	28	26
<b>E</b>	14	10	12	11	15



ii) Find initial basic feasible solution of the following transportation problem by VAM. The entries in the matrix indicate the cost in rupees of transporting a unit from a particular source to a particular destination.

Source	Destination				Supply
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
S <sub>1</sub>	15	18	22	16	30
S <sub>2</sub>	15	19	20	14	40
S <sub>3</sub>	13	16	23	17	30
<b>Demand</b>	20	20	25	35	

Also, you are required to test whether the basic feasible solution obtained is optimal ?

iii) Find a distribution pattern of the following transportation problem for maximum profit. The entries in the matrix indicate the profits in rupees.

Factory	Sales Region			Supply
	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	
F <sub>1</sub>	6	6	1	150
F <sub>2</sub>	-2	-2	-4	100
F <sub>3</sub>	3	2	2	130
<b>Demand</b>	80	110	150	

4) Attempt **any one** of the following :

**10**

i) Solve the following L.P.P. by Big-M-method.

$$\text{Min } Z = 150x_1 + 150x_2 + 100x_3$$

Subject to

$$2x_1 + 3x_2 + x_3 \geq 4$$

$$3x_1 + 2x_2 + x_3 \geq 3$$

$$x_1, x_2, x_3 \geq 0$$

ii) Solve the dual of the following problem. Then find optimal solution of the primal from the solution of the dual.

$$\text{Min } Z = x_1 + x_2$$

Subject to

$$x_1 + 2x_2 \geq 2$$

$$x_1 + 7x_2 \geq 7$$

$$x_1, x_2 \geq 0.$$



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**PHYSICS (Paper – I) (New) (2008 Pattern)**  
**PH-331 : Mathematical Methods in Physics**

Time : 2 Hours

Max. Marks : 40

- N. B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of log tables and calculators is allowed.*

1. Attempt **all** of the following (**each** of mark **1**) :

- What do you mean by curvilinear coordinate system ?
- Write generating function for Legendre polynomials.
- State degree and order of the differential equation :

$$\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + xy = 0 .$$

d) Define singular point of a differential equation of the form :

$$y'' + P(x)y' + Q(x)y = 0, \text{ where } y'' = \frac{d^2y}{dx^2} .$$

- Write Laplacian operator in cylindrical coordinates.
- What is doppler effect ?
- State Fuch's theorem.
- Calculate the mass of electron when it is moving with K.E. 10 MeV.
- Explain degree of differential equation.
- Write transformation relations between Cartesian coordinates and cylindrical coordinates.

2. Attempt **any two** :

- Show that the point  $x = 0$  is an ordinary point of the Legendre differential equation  $(1 - x^2)y'' - 2xy' + \ell(\ell + 1)y = 0$ .

**5**

**P.T.O.**



b) Describe time dialation on the basis of Lorentz transformation equations. **5**

c) Prove that :

$$J_{n+1}(x) + J_{n-1}(x) = \frac{2n}{x} J_n(x). \quad \mathbf{5}$$

3. Attempt **any two** :

a) Show that the volume element in curvilinear coordinate system is  
 $dv = h_1 h_2 h_3 du_1 du_2 du_3.$  **5**

b) Using Rodrigues formula for Legendre polynomials, determine  $P_0(x)$ ,  $P_1(x)$   
 and  $P_2(x).$  **5**

c) Derive an expression for length contraction on the basis of Lorentz  
 transformation equations. **5**

4. A) Using the recurrence relation :

$$a_{n+z} = \frac{(n+k)(n+k+1) - \ell(\ell+1)}{(n+k+2)(n+k+1)} a_n$$

Obtain the series solution of Legendre equation for :

i)  $k = 0$ ,  $a_1 \neq 0$  and

ii)  $k = 1$ ,  $a_1 = 0.$  **8**

OR

A) Describe Michelson-Morley experiment and explain the physical significance  
 of negative results. **8**

B) Attempt **any one** :

a) Prove that  $J'_0(x) = -J_1(x).$  **2**

b) State postulates of special theory of relativity. **2**



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**PHYSICS (Paper – II) (New) (2008 Pattern)**  
**PH-332 : Classical Electrodynamics**

Time: 2 Hours

Max. Marks: 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of log tables and calculator is allowed.*

1. Attempt **all** of the following (1 mark each) :

**10**

- Define the term 'electrical image'.
- State Biot and Savart law.
- Define 'Magnetization  $\vec{M}$ '
- What do you mean by 'polar molecule' ?
- Give physical significance of the equation  $\vec{\nabla} \cdot \vec{B} = 0$ .
- What do you mean by 'plane polarized wave' ?
- Write Faraday's law in differential form.
- Explain the term 'displacement current'.
- Find the magnitude of electric intensity ( $\vec{E}$ ) at a point at a distance of 10.0 cm from a point charge  $q = 4 \times 10^{-9}$  c.  $\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ c}^2/\text{N} - \text{m}^2 \right)$ .
- Two point charges  $q_1 = 3 \times 10^{-6}$  c and  $q_2 = 1.5 \times 10^{-6}$  c are separated by a distance of 9 cm from each other. Find the potential energy of the system.

**P.T.O.**



2. Attempt **any two** :

a) Write Maxwell's equations in integral form. Give physical significance of these equations. 5

b) Define the terms :

i) Magnetic susceptibility ( $\chi_m$ )

ii) Magnetic permeability ( $\mu$ )

iii) Relative permeability ( $\mu_r$ ).

Classify the magnetic materials using the values of  $\chi_m$ . 5

c) What is magnetic vector potential ? Obtain an expression for it in the form

$$\vec{A} = \frac{\mu_0 I}{4\pi} \oint \frac{d\vec{e}}{r}$$

5

Where symbols have their usual meanings.

3. Attempt **any two** :

a) Two long parallel ( $A_e$ ) wires separated by 35 cm in air carry current 8A and 25A in the same direction. Find force per unit length of the wire. State whether the force is attractive or repulsive. 5

b) Find magnitudes of polarization  $\vec{P}$  and electric intensity  $\vec{E}$  in a homogeneous and isotropic dielectric material with  $K = 1.8$ , if  $D = 4.2 \times 10^{-7} \text{ C/m}^2$

$$(\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N} - \text{m}^2).$$

5

c) Two insulated charged spheres with charges 5 C and 20 C are placed at a distance of 21 cm from each other. Locate the position of the point on the line joining them where electric intensity ( $\vec{E}$ ) is zero. 5

4. A) Attempt **any one** :

1) A point charge 'q' is placed at a distance 'd' from the centre of grounded conducting sphere of radius 'a'. Find magnitude, position and sign of image charge, and hence obtain an expression for electric potential at any exterior point. 8



- 2) Show that in a charge free non-conducting medium, Maxwell's equations lead to wave equations in  $\vec{E}$  &  $\vec{H}$  8

$$\nabla^2 \vec{E} - \frac{1}{C^2} \frac{\partial^2 \vec{E}}{\partial t^2} = 0$$

$$\nabla^2 \vec{H} - \frac{1}{C^2} \frac{\partial^2 \vec{H}}{\partial t^2} = 0$$

B) Attempt **any one** :

- 1) A conductor 8 m long is kept in uniform magnetic field of induction  $\vec{B} = 0.06 \hat{a}_z$  tesla. It lies in X-direction and carry current of 3A in  $\hat{a}_x$  direction. Find force acting on the conductor. 2

- 2) Find the value of intrinsic impedance of space using the data :

i)  $\mu_0 = 4\pi \times 10^{-7}$  wb / A.m

ii)  $\epsilon_0 = 8.85 \times 10^{-12}$  C<sup>2</sup> / N – m<sup>2</sup>. 2



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**Paper – V : PHYSICS**  
**PH – 335 : ‘C’ Programming and Computational Physics**  
**(New) (2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- N.B. : 1) All questions are compulsory.*  
*2) Figures to the right indicate full marks.*  
*3) Flow charts may be drawn with pencil.*  
*4) Use of electronic calculator or log table is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) Define flowchart.
  - b) What is the use of switch statement ?
  - c) Give syntax of printf function.
  - d) State different types of data used in ‘C’.
  - e) What is the use of continue statement ?
  - f) What is the purpose of return statement in function ?
  - g) What is roundoff error ?
  - h) What are ‘C’ tokens ?
  - i) Define pointers used in ‘C’.
  - j) What is difference between gets () and puts () function ?
2. Attempt **any two** of the following :
- a) State different types of constants. Explain any two with appropriate examples. **5**
  - b) Explain do ... while statement with suitable example. How it differs from while statement ? **5**
  - c) Give syntax of the following graphics commands : line, circle, arc, ellipse, bar. **5**

**P.T.O.**



3. Attempt **any two** of the following :

- a) Explain recursion function in detail. **5**
- b) What is an array ? Explain passing arguments to function by call by reference. **5**
- c) What is variable ? What are the rules applied for naming variables ? Explain with suitable example. **5**

4. A) Attempt **any one** of the following :

- a) i) In simple electrical circuit, the values of current I passing through a resistance are given for different values of P.D.V. across R. Least square. Fit a straight line for the following points. **4**

<b>V (Volt)</b>	1	2	4	5	6	8	9
<b>I (MA)</b>	2	5	7	10	12	15	19

- ii) Write an algorithm to find integration by trapezoidal rule. **4**
- b) i) Find root of equation  $x^3 - 2x - 5 = 0$  using Bisection method. **4**
- ii) Write a 'C' program to find smallest of three integer numbers using nested for loop. **4**

B) Attempt **any one** of the following :

- a) Calculate absolute error when true value is  $5 \times 10^{-6}$  and approximate value is  $4.5 \times 10^{-6}$ . **2**
- b) State advantages of algorithm. **2**



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**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**CHEMISTRY (Paper – I)**  
**CH – 331 : Physical Chemistry**  
**(2008 Pattern) (New Course)**

Time: 2 Hours

Max. Marks: 40

- N.B. : 1) All questions are compulsory.*  
*2) Figures to the right indicate full marks.*  
*3) Use of logarithmic table and calculator is allowed.*  
*4) Actual calculations must be shown while solving problems.*

1. Answer the following :

10

- a) Define the term 'Specific reaction rate'.
- b) Calculate frequency of visible radiation of wavelength 520 nm.  
( $C = 3.0 \times 10^{10} \text{ cm sec}^{-1}$ ).
- c) Sketch 100 plane in FCC crystal lattice.
- d) Define the term 'Adsorbate' with suitable example.
- e) Write the exponential form of Arrhenius equation and give meaning of the terms.
- f) Why  $\text{CD}_2$  molecule does not show rotational spectra ?
- g) What do you mean by Heat of adsorption ?
- h) The intercepts by crystal plane on the three crystallographic axes are  $\frac{1}{2}$ , 2 and  $\infty$ . calculate miller indices.
- i) The rate constant for the certain first order reaction,  $A \rightarrow \text{Products}$  is  $3.0 \times 10^{-5} \text{ sec}^{-1}$ . If the rate is  $2.4 \times 10^{-5} \text{ mol L}^{-1} \text{ sec}^{-1}$ , then calculate the concentration of reactant 'A' in  $\text{mol lit}^{-1}$ .
- j) Explain the term 'plane of symmetry'.

P.T.O.



2. A) Attempt the following (**any two**) : 6
- i) Give the characteristics of rate constant 'k' of first order reaction.
  - ii) Define the term dipole moment. Describe any one method for its determination.
  - iii) What is crystallography ? State and explain the law of elements of symmetry.
- B) Solve **any one** of the following : 4
- i) The first order reflection of a beam of x-rays from a given crystal occurs at  $6.3^\circ$ . At what angle a third order reflection will occur ?
  - ii) Molar polarization of silico-bromo form is 45.98 cc at  $25^\circ\text{C}$ , if polarizability of molecule is  $1.31 \times 10^{-23}$ , calculate dipole moment of molecule ( $N = 6.023 \times 10^{23}$ ,  $k = 1.38 \times 10^{-16}$  crgs  $\text{deg}^{-1}$  molecule $^{-1}$ ,  $R = 2.0$  cal  $\text{mol}^{-1}\text{deg}^{-1}$ ).
3. Answer **any two** of the following : 10
- i) Derive the expression for the rate constant of first order reaction. How it is determined graphically ?
  - ii) What is rotational spectra ? Derive an expression for energy of transition from  $J \rightarrow J + 1$  level in rotational spectrum of a simple diatomic molecule.
  - iii) Write notes on : Weiss and Miller's indices.
4. A) Derive expression for Langmuir adsorption isotherm giving its assumptions. 6
- OR
- A) Attempt the following : 6
- a) Distinguish between Raman Spectra and Infrared spectra.
  - b) Derive an expression for rate constant of a reaction in which single reacting gas is moderately adsorbed.
- B) Solve **any one** of the following : 4
- i) In the Arrhenius equation for a certain reaction, the values of 'A' and  $E_a$  (Activation energy) are  $4.0 \times 10^{13} \text{ S}^{-1}$  and  $98.6 \text{ kJ mol}^{-1}$ , respectively. If the reaction is of first order, at what temperature will its half life period be ten minutes ?  
[ $R = 8.314 \text{ J mol}^{-1}\text{K}^{-1}$ ]
  - ii) The frequency difference for successive lines in the rotational spectrum of HI molecule is observed to be  $12.8 \text{ cm}^{-1}$ . Calculate the rotational constant and the bond length at equilibrium.  
[At. wts.  $\text{H} = 1$ ,  $\text{I} = 127$  and  $N = 6.023 \times 10^{23}$ ,  $h = 6.626 \times 10^{-27} \text{ erg.sec}$ ].



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**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**CHEMISTRY**  
**CH – 332 : Inorganic Chemistry (Paper – II)**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Actual calculations must be shown while **solving the problems.***  
4) *Marks are reserved for **neat** and labelled diagrams.*  
5) *Use of log table and calculator is **allowed.***  
6) *Atomic Numbers : O (8), Cr (24), Fe (26), Co (27), Ni (28).*

1. Attempt the following :

**10**

- i) What is the bond order of  $B_2$  molecule ?
- ii) How many unpaired electrons are in  $O_2$  molecule as per the MOT ?
- iii) What is the coordination number of Mg in  $[Mg(EDTA)]^{2+}$  ?
- iv) Why  $[Pt(NH_3)_2(Cl)_4]$  is non-electrolyte ?
- v) Draw facial isomer of  $[Co(NH_3)_3(Cl)_3]$ .
- vi) What is EAN for the complex  $[Fe(CO)_5]$  ?
- vii) Give 'spin only formula' for the calculation of magnetic moment.
- viii) In an octahedral complex how many ligands are placed at the corners of octahedron ?
- ix) Whether the  $d^6$  ion in weak octahedral field is paramagnetic or diamagnetic ?
- x) What is the symmetry symbol for d-orbitals directed in between the axis ?

**P.T.O.**



2. A) Answer **any two** of the following : 6
- i) Discuss the bonding in  $C_2$  molecule on the basis of MOT.
  - ii) Write the formula for each of the following complexes:
    - a) Potassium tetrachlorochromate (II)
    - b) Bis (benzene) chromium (O)
    - c) Nitritopentammine cobalt (III) chloride.
  - iii) State assumptions of Werner's theory.
- B) Answer **any two** of the following : 4
- i) Distinguish between  $BMO_s$  and  $ABMO_s$ .
  - ii) Discuss ionisation isomer with example.
  - iii) State and explain EAN rule with suitable example.
3. Answer **any two** of the following : 10
- i) Explain bonding, structure and magnetic properties of  $[Ni (Cl)_4]^{2-}$ .
  - ii) Draw M.O. energy level diagram of  $[Co (CN)_6]^{3-}$  without  $\pi$ -bonding.
  - iii) For the hexa-aquo and hexa-cyano complexes of Cr (II) and Cr (III), the 10 Dq values are  $17,830\text{ cm}^{-1}$  and  $26,280\text{ cm}^{-1}$  respectively. The electron pairing energy P is  $23,500\text{ cm}^{-1}$ . Which is more stable complex ? Why ? Find the magnetic moment of each complex.
4. A) Write short notes on : 6
- a) LCAO Principle.
  - b) Paramagnetism of NO molecule as per MOT.
- OR
- A) Answer the following : 6
- i) Discuss evidences for crystal field stabilization energy.
  - ii) Explain bonding in  $N_2$  molecule on the basis of MOT.
- B) Explain bonding and magnetic properties of  $K_3 [Fe (CN)_6]$ . 4
- OR
- B) Answer the following : 4
- i) Draw geometrical isomers of  $[Cr (en)_2 (Cl)_2]^+$ .
  - ii) What do you mean by inert and labile complexes ?





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**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**CHEMISTRY (Paper – III)**  
**CH – 333 : Organic Chemistry (2008 Pattern) (New Syllabus)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) *All questions are compulsory.*  
ii) *Figures to right indicate full marks.*  
iii) *Draw the structures and neat diagram if necessary.*

1. Answer the following : 10

- i) Write full name and correct structure of DDQ.
- ii) Cis 1, 3 dimethyl cyclohexane is more stable than its trans isomer. Why ?
- iii) Guanidine is extremely strong base. Why ?
- iv) As the size of leaving group increases, proportion of Hofmann product increases. Explain.
- v) Which type of group is reduced by Sn/HCl ?
- vi) Write the intermediate during addition of performic acid to  $\text{C}=\text{C}$ .
- vii) List the factors affecting addition of nucleophile to  $\text{C}=\text{O}$  group.
- viii) What is  $\text{S}_{\text{N}}^1$  reaction ?
- ix) 1-iodopropane undergoes faster  $\text{E}_2$  elimination than 1-chloropropane. Why ?
- x) Draw Zig-Zag structure of 3-buten-1-ol.

2. A) Answer **any two** of the following : 6

- i) Explain the hydrogen bonding with suitable examples.
- ii) Ketone reacts with 1, 2 diol to form cyclic ketal. Suggest mechanism and use for this reaction.
- iii) Give any three applications of  $\text{NaBH}_4$ .

B) Attempt **any two** of the following : 4

- i) Propyne on hydration gives 2-propanone. Explain.
- ii) Benzyl chloride undergoes  $\text{S}_{\text{N}}^1$  mechanism and not  $\text{S}_{\text{N}}^2$  mechanism. Explain.
- iii) Explain with mechanism when 2-Methyl propene reacts with HBr in presence of peroxide.

P.T.O.

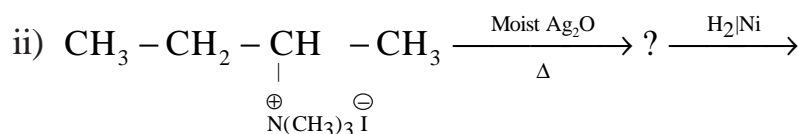
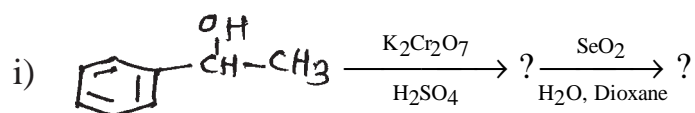


3. Attempt **any two** of the following : **10**
- i) Draw chair conformations of trans-1,3-dimethyl cyclohexane. Comment on their stability and optical activity.
  - ii) What is  $\beta$ -elimination reaction ? Discuss the mechanism of  $E_2$  reaction with example. Give one evidence supporting  $E_2$  reaction.
  - iii) What is resonance effect ? Give the conditions necessary for resonance. Explain the 2, 4, 6-trinitrophenol is more acidic than phenol.
4. A) i) What is ozonolysis ? Discuss the mechanism of addition of  $O_3$  molecule to 2-butene. **3**
- ii) Discuss the mechanism of cross cannizzaro's reaction with suitable example. **3**

OR

- A) i) What is  $SN^2$  reaction ? Discuss the stereo chemistry of  $SN^2$  with experimental evidences. **4**
- ii) Determine which is good nucleophile in each pairs why ?
- a)  $H_2O$  and  $H_2S$  b)  $\overset{\ominus}{N}H_2$  and  $NH_3$  **2**

- B) Predict the product with Justification. **4**



OR

- B) Write notes on : **4**
- i)  $E_1CB$  mechanism
  - ii) Cis-hydroxylation.



[3817] – 324

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**CHEMISTRY (Paper – V)**  
**CH – 335 : Industrial Chemistry**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :* 1) *All questions are compulsory.*  
2) *Figures to **right** indicate **full** marks.*  
3) *Draw **neat** diagram and flow sheet **wherever** necessary.*

1. Answer the following : **10**

- i) What is “Patent Act” ?
- ii) Give one method for concentration of nitric acid.
- iii) What are “Micro Nutrients” ?
- iv) Sugarcane cut from the field should be crushed within 24 hours. Explain.
- v) What is a “Process Control” ?
- vi) Explain the term “Biodegradable Waste”.
- vii) Define the term “Selectivity”.
- viii) What do you mean by Molasses ?
- ix) What is Absolute Alcohol ?
- x) What are different types of wastes ?

2. A) Attempt **any two** of the following : **6**

- i) Explain the terms unit process and unit operation with suitable examples.
- ii) What are importance of fertilizers ?
- iii) What is water gas and producer gas ? How they are produced ?

**P.T.O.**



B) Answer **any two** of the following : **4**

i) Explain the term Quality Control and Quality Assurance involved in Chemical Industry.

ii) What are basic requirements for Chemical Industries ?

iii) Explain the concept of atom economy with suitable example.

3. Answer **any two** of the following : **10**

i) Describe with flow sheet the manufacture of sugar from sugarcane.

ii) Discuss with flow sheet the manufacture of ethyl alcohol from food grains.

iii) Explain in detail the various terms involved in waste minimization.

4. A) Describe the manufacture of sulphuric acid by contact process with special reference to contact converter. **6**

OR

What are nitrogenous fertilizers ? Describe with flow sheet and chemical reactions, the manufacture of Urea.

B) Explain one physical and one chemical method for testing and estimation of Sugar. **4**

OR

Describe the manufacture of wine from grapes.

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[3817] – 325

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**CHEMISTRY (Paper – VI)**  
**CH – 336 (A) : Nuclear Chemistry**  
**(2008 New Pattern)**

Time: 2 Hours

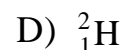
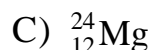
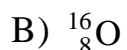
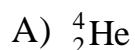
Max. Marks: 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw the diagrams wherever necessary.*  
4) *Use of log tables and calculator is allowed.*

1. Answer the following :

10

a) Which of the following nuclei is least stable ?



b) Define binding energy and mean binding energy.

c) What is the value of N/Z ratio for stability of nucleus ?

d) State the limitations of liquid drop model.

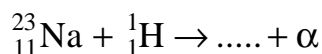
e) The half life of a particular isotope is 10 years. What is the value of decay constant ?

f) Which are the two  $\alpha$  active nuclides ?

g) Which are the two processes by which compound nucleus returns to ground state ?

h) Define thermonuclear reaction.

i) Complete the following nuclear reaction.



j) Define nuclear isomerism and isomeric transition.

2. A) Attempt **any two** of the following :

6

a) Write short notes on reaction cross section.

b) Explain Bethe's notations. What are the different types of nuclear reactions ?

c) Discuss the classification of nuclides on the basis of their mass number (A) and atomic number (Z).

P.T.O.



B) Answer **any two** of the following : **4**

a) Calculate the binding energy of deuteron.

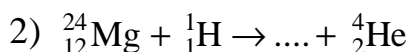
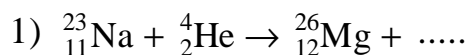
Given : Mass of proton = 1.008 amu

Mass of neutron = 1.0078 amu

Mass of deuteron = 2.014 amu.

b) Define photonuclear reactions. What are the different types of photonuclear reactions ?

c) Complete the following nuclear reaction.



3. Answer **any two** of the following : **10**

a) Explain different types of radioactive decay processes with suitable examples.

b) Write short notes on :

1) The alpha energy spectrum and

2) Geiger-Nuttal's law.

c) State and explain semi-empirical mass equation. State its applications.

4. A) Give salient features of shell model. What are the advantages and disadvantages of shell model ? **6**

OR

A) Describe liquid drop model in detail giving postulates. **6**

B) Explain Fermi theory of  $\beta$  decay. **4**

OR

B) Disintegration of 1 gram  ${}^{222}\text{Ac}$  was studied, 0.563 gram of actinium remained after 5 hours. Find the half life of  ${}^{222}\text{Ac}$ . **4**

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**CHEMISTRY (Paper – VI)**  
**CH – 336 (B) : Polymer Chemistry**  
**(2008 Pattern) (New)**

Time: 2 Hours

Max. Marks: 40

- Instructions :* 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw figures wherever necessary.*  
4) *Use of log table/calculator is allowed.*

1. Answer the following :

10

- i) Write the name of first synthetic fibre.
- ii) Draw the structure of polyester polymer.
- iii) Name the polymer chemist who invented the bakelite.
- iv) Calculate the molecular weight of polypropylene whose DP is 500.
- v) State whether the following statement is true or false.  
Nylon is the best example of polyamide.
- vi) Give two important applications of polyethylene.
- vii) Write the IUPAC name of  
$$\left( \text{CH}_2 - \underset{\text{Ph}}{\text{CH}} \right)_n$$
- viii) Give two important colourants used in polymers.
- ix) Name two common stabilizers in the polymers.
- x) Give the chemical name of teflon.



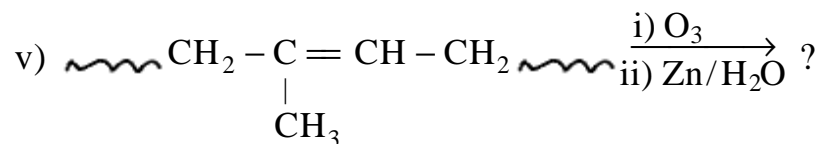
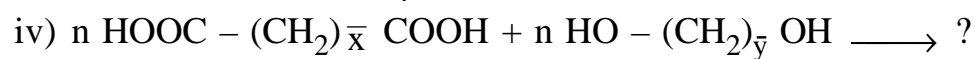
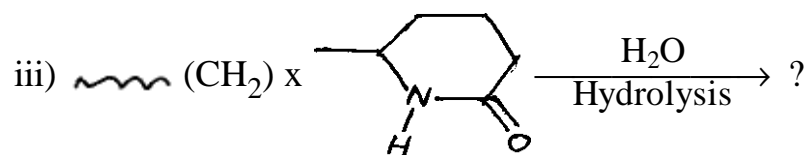
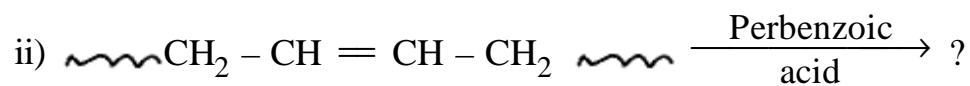
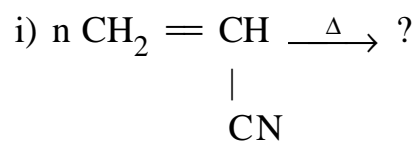
2. A) Explain **any three** of the following : **6**
- i) Additives are added to the polymer processing.
  - ii) PVC is the gift to farmers.
  - iii) Biodegradable polymers is the need of the world.
  - iv) Modern age is the age of polymers.
- B) How will you distinguish the following (**any two**) : **4**
- i) Linear and crosslinked polymers.
  - ii) Fibres and plastics.
  - iii) Homopolymers and Heteropolymers.
3. Answer **any two** of the following : **10**
- i) Give a detail account of pearl (suspension) polymerisation. Give their merits.
  - ii) Discuss in detail the end group analysis method for determination of the molecular weight of polymer.
  - iii) Write a detail note on-Ziegler-Natta catalyst.
4. A) Attempt **any two** of the following : **6**
- i) A basket of apples contains sets of 'A', 'B' 'C' and 'D' with their numbers and weight of apples as shown below.  
Set 'A' – 8 apples with its weight 100 g  
Set 'B' – 10 apples with its weight 150 g  
Set 'C' – 12 apples with its weight 200 g  
Set 'D' – 15 apples with its weight 300 g  
Calculate the number average molecular weight ( $\overline{M}_n$ ) for the apples.
  - ii) Discuss the effect of the percentage of chlorine in chlorinated rubber.
  - iii) Write a note on Haze and Gloss properties of polymers.





B) Complete the following reactions of polymers (**any four**) :

4



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**CHEMISTRY (Paper – VI)**  
**CH – 336 (C) : Biochemistry**  
**(2008 Pattern) (New Course)**

Time: 2 Hours

Max. Marks: 40

**Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagrams wherever necessary.*

I. Answer the following : **10**

- 1) Name epimers of glucose.
- 2) Define acid value.
- 3) Name monosaccharide unit of glycogen.
- 4) Give names of two saturated fatty acids.
- 5) Define the term hormones.
- 6) Give structure of tyrosine.
- 7) What are coenzymes ?
- 8) Name two water soluble vitamins.
- 9) Give examples of acidic amino acids.
- 10) What are essential amino acids ?

II. A) Attempt **any two** : **6**

- 1) Discuss structure and function of Lysosomes.
- 2) Write a note on fat soluble vitamins.
- 3) Discuss simple lipids.

B) Give structures of following (**any two**) : **4**

- 1) Lys-Ala-Cys-Ser
- 2) Gly-Val-Tyr-Asp
- 3) Phe-Ala-Ser-Ley.



III. Answer **any two** of the following : **10**

- 1) Discuss various classes of enzymes with suitable examples.
- 2) Give principle, working and application of electrophoresis.
- 3) Describe classification of hormones on the basis of biochemical nature.

IV. A) Discuss various class of carbohydrates giving example of each class. **6**

OR

A) Discuss reactions of amino acids with FDNB, Dansyl Chloride and Edmans reagent.

B) Discuss biological functions of proteins. **4**

OR

B) Write short account on reactions of Glucose.

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**CHEMISTRY (Paper – VI)**  
**CH – 336 (D) : Environmental Chemistry**  
**(2008 Pattern) (New)**

Time: 2 Hours

Max. Marks: 40

**Instructions :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*  
iii) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in brief :

**10**

- i) What is receptor ?
- ii) What is meant by lapse rate ?
- iii) Mention primary air pollutants.
- iv) Define : Nitrification.
- v) Which are the major components of atmosphere ?
- vi) What is stratification of water bodies ?
- vii) Mention organic water pollutants.
- viii) What was the cause of minamata disease ?
- ix) What is COD ?
- x) Mention any two environmental factors causing health hazards.

2. a) Attempt **any two** of the following :

**6**

- i) Give different major regions of atmosphere with their respective temperature ranges and important chemical species.
- ii) Mention microbially mediated aquatic reactions.
- iii) Comment upon soil toxicology.



- b) Write short notes on **any two** : **4**
- i) B.O.D.
  - ii) Acid rain
  - iii) Soil erosion.

3. Attempt **any two** of the following : **10**
- i) Mention any two methods of sampling of vapours and gases.
  - ii) What is smog ? Give the comparison between reducing and oxidising smog.
  - iii) Describe 'Bhopal disaster'.

4. a) What is TOC ? How is it estimated ? **6**
- OR

Describe any one method of estimation of dissolved oxygen in water.

- b) Answer the following (**any one**) : **4**
- i) Comment upon pathways of lead in environment.
  - ii) Describe consequences of oil spills.

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**CHEMISTRY (Paper – VI)**  
**CH – 336 (E) : Agriculture Chemistry**  
**(2008 Pattern) (New)**

Time: 2 Hours

Max. Marks: 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw the diagrams wherever necessary.*

1. Answer the following : **10**
- a) Draw Pryanishnikov triangle.
  - b) What is soil texture ?
  - c) Define saline soil.
  - d) What is TDS water ?
  - e) How are essential nutrients classified ?
  - f) Which factors affect potassium fixation of soil ?
  - g) What are Herbicides ?
  - h) Classify fertilisers.
  - i) What are the different types of microorganisms present in water ?
  - j) Define buffer capacity.
2. A) Attempt **any two** of the following : **6**
- 1) What is lime requirement ? State effect of lime on acid soil.
  - 2) Discuss the method of expression and the quality of irrigation water.
  - 3) What is nitrification ? Explain how does the nitrogen fixation take place in air.
- B) Attempt **any two** : **4**
- 1) Explain with diagram the nutrient cycle in agriculture.
  - 2) Discuss importance of soil reaction.
  - 4) Explain salinity classes for irrigation water.



3. Answer **any two** : **10**
- 1) What is acid soil ? Explain its formation and reclamation along with effect on plant growth.
  - 2) Define green manuring. What are advantages of green manuring ? Discuss green leaf manuring.
  - 3) Give the importance of
    - a) Soil colour
    - b) Soil pH
    - c) Soil composition
    - d) Soil structure in the fertility of soil.
4. A) Attempt **any two** : **6**
- 1) Discuss the major impurities found in raw water.
  - 2) What is night soil ? Give improved method of night soil.
  - 3) Explain the insecticidal activity of Carbaryl and Baygon.
- B) Answer **any two** : **4**
- 1) Give general functions of micro nutrients.
  - 2) Give classification of pest control measure.
  - 3) Write a note on time and methods of fertiliser application.
-

**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**BOTANY (Paper – II) (New Course) (2008 Pattern)**  
**BO-332 : Molecular Biology**

Time : 2 Hours

Max. Marks : 40

**Instructions:** i) *All questions are compulsory.*  
 ii) *Draw neat labelled diagrams wherever necessary.*  
 iii) *Figures to the right indicate full marks.*

1. Attempt the following : **10**
    - a) What do you mean by DNA damage ?
    - b) Define molecular biology.
    - c) What is conservative mode of replication of DNA ?
    - d) Write any two types of genomics.
    - e) Define recon.
    - f) Give significance of Franklin and Wilkin's work.
    - g) Define genetic code.
    - h) Write any two functions of ribosomes.
    - i) Define inducible enzymes.
    - j) What is transcription ?
  
  2. Attempt **any two** of the following : **10**
    - a) Give significance of promoters in gene.
    - b) Explain any two properties of genetic code.
    - c) Describe role of tRNA in protein synthesis.
  
  3. Write notes on **any two** of the following : **10**
    - a) Dark excision repair.
    - b) C-value paradox.
    - c) Proteomics.
  
  4. Describe carbohydrates and proteins as molecules of a cell. **10**
- OR
4. Explain post transcriptional events in eukaryotes. **10**





[3817] – 328

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**BOTANY (Paper – III)**  
**BO – 333 : Angiosperms and Evolution**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Draw neat labelled diagrams wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following :

**10**

- a) Who has proposed phylogenetic system of classification ?
- b) Name type of fruit in family Leguminosae.
- c) Give floral formula of family Nyctaginaceae.
- d) Enlist two distinguishing characters of family Lamiaceae.
- e) Give two examples of family Magnoliaceae.
- f) State era of Pteridosperms.
- g) Name a chemical used for poisoning herbarium plant.
- h) Name any two most common plants from West Indian Deserts.
- i) Enlist states included in Deccan region.
- j) What is the objective of Botanical Survey of India ?

**P.T.O.**



2. Answer **any two** of the following : **10**
- a) Give distinguishing characters and two examples of Family Amaranthaceae.
  - b) Explain importance of herbaria.
  - c) Discuss the floristic studies in Maharashtra.
3. Write short notes on **any two** of the following : **10**
- a) Merits and demerits of Engler and Prantl's system.
  - b) Bennettitalean theory of origin of angiosperms.
  - c) Pseudoendemics.
4. Give distinguishing characters, floral formula and floral diagrams of Acanthaceae and Cannaceae. **10**

OR

What is evolution ? Explain the evolution at molecular level. **10**



[3817] – 331

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**BOTANY (Paper – VI)**  
**BO – 336 : Cell Biology and Seed Technology**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- i) All questions are compulsory.*
  - ii) Draw neat labelled diagrams wherever necessary.*
  - iii) Figures to the right indicate full marks.*

1. Attempt the following :

10

- a) What is 'Svedberg's Unit' ?
- b) Give any two properties of cytoplasmic matrix.
- c) Give any two functions of chromoplast.
- d) Name the genetic material in prokaryotic cell.
- e) What is significance of meiosis ?
- f) Enlist any two functions of plasma membrane.
- g) What is phagocytosis ?
- h) Mention any two types of seed storage.
- i) What is seed certification ?
- j) What is fumigation of seed storage ?

P.T.O.



2. Answer **any two** of the following : **10**
- a) Explain development of Mitochondria in eukaryotic cell.
  - b) Describe functions of endoplasmic reticulum.
  - c) Give seed processing sequence for oil seeds.
3. Write short notes on **any two** of the following : **10**
- a) Cell cycle.
  - b) Polytene chromosome.
  - c) Certified seed.
4. Describe the structure of a nucleus and give its functions. **10**

OR

What is seed marketing ? Describe seed pricing, supply and demand for different kinds of seeds. **10**

**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**ZOOLOGY (Paper – I)**  
**ZY – 331 : General Zoology (2008 Pattern)**  
**(New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) *All questions are compulsory.*  
2) *Neat labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following : **10**
- 1) State the function of scales in *Calotes*.
  - 2) State any two blood cells in *Pila*.
  - 3) What is heterodont dentition ?
  - 4) Give an example of Hemichordata.
  - 5) State the types of sperms in *Pila*.
  - 6) What is archeonephros kidney ?
  - 7) State the habitat of *Pila*.
  - 8) Mention the organ of excretion in *Calotes*.
  - 9) What is torsion in mollusca ?
  - 10) State the function of radula in *Pila*.
2. Attempt **any two** of the following : **10**
- i) Describe any two larval forms of crustacea.
  - ii) Give an account of neoteny in Amphibia.
  - iii) Describe habit and habitat of *Calotes*.
3. Write notes on **any two** of the following : **10**
- a) Affinities of Hemichordata.
  - b) Diprioi
  - c) Digestive gland of *Pila*.
  - d) External characters of *Calotes*.
4. Describe nervous system of *Pila*. **10**

OR

Describe morphological variations in different regions of brain of *scoliodon*, frog.



[3817] – 335

**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**ZY – 334 : ZOOLOGY (Paper – IV)**  
**Environmental Biology and Toxicology**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) *All questions are compulsory.*  
ii) *Neat labelled diagrams must be drawn wherever necessary.*  
iii) *Figures to the right indicate full marks.*

1. Attempt the following: **10**
- 1) What is environmental biology ?
  - 2) What is primary producer ?
  - 3) What is food additive ?
  - 4) What is sewage ?
  - 5) What is soil erosion ?
  - 6) Name any two renewable sources.
  - 7) Define pesticide.
  - 8) What is LD50 ?
  - 9) What is intoxication ?
  - 10) What is hazard ?
2. Attempt **any two** of the following : **10**
- i) Explain the factors affecting toxicity.
  - ii) Explain the causes of wild life depletion.
  - iii) What are bioindicators ? How are they helpful for environment monitoring ?
3. Write short notes on **any two** : **10**
- a) Carbon cycle.
  - b) Basic tests to detect pollutants.
  - c) Goals and objectives of environmental education.
  - d) Soil conservation.
4. What is ecosystem ? Explain in detail the various components of forest ecosystem. **10**
- OR
4. What is pollution ? Explain the sources of water pollution and add a note on effect of water pollution. **10**



[3817] – 338

**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**GEOLOGY (Paper – I)**  
**(New Course)**  
**GL-331 : Mineralogy**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- Instructions.** : 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Black figures to the right indicate full marks.*  
4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in **2/3** lines.
- a) Define 'Isomorphism'.
  - b) Define 'Refractive Index' of a mineral.
  - c) Give names of any two polymorphs of potassium feldspars.
  - d) Give name of a phosphate mineral.
  - e) Give chemical composition of calcite.
  - f) Give crystal system of pyrite.
  - g) Give name of one precious and one semi-precious stone.
  - h) Give one important use of Graphite.
  - i) Give geological occurrence of gypsum.
  - j) Give names of any two tectosilicate minerals. **10**
2. Write notes on (**any two**) :
- a) Paragenesis of olivine
  - b) Chemical composition and varieties of garnet mineral group
  - c) Uses of gypsum as non-metallic mineral deposit. **10**
3. Write notes on (**any two**) :
- a) Becke line method
  - b) Chemical composition, paragenesis and properties of Fluorite
  - c) Geological and geographical distribution of mica and uses of mica minerals. **10**
4. Give silicate structure, chemical composition, physical and optical properties/character paragenesis and alteration products of Orthopyroxenes OR Aluminosilicates. **10**



[3817] – 340

**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**(New Course)**  
**GEOLOGY (Paper – III)**  
**GL-333 : Sedimentary Petrology**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- Instructions :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Black figures to the right indicate full marks.*  
4) *Neat diagrams must be drawn wherever necessary.*

1. Answer/define/explain the following in **2/3** lines :
- a) Name any two branches of sedimentology.
  - b) What are epigenetic sedimentary ores ?
  - c) Heavy minerals.
  - d) Maturity of sediment.
  - e) Roundness of clastic fragment.
  - f) Name any two organic sedimentary structures.
  - g) Lamination suggests which type of environment.
  - h) Define the term sedimentation.
  - i) Name any two mineral fertilizers of sedimentary origin.
  - j) What are allogenic minerals ? **10**
2. Write notes on (**any two**) :
- a) Mineral stability series
  - b) Placer sedimentary ores
  - c) Concept of provenance. **10**
3. Write notes on (**any two**) :
- a) Environmental significance of cross bedding.
  - b) Biological parameters of environment.
  - c) Sedimentary facies. **10**
4. Define texture of sediments. Describe the factors controlling textures of sedimentary rocks.

OR

Define sedimentary environment. Describe the marine environment. **10**



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**GEOLOGY (Paper – V) (New Course)**  
**GL – 335 : Precambrian Stratigraphy of India**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :*
- 1) *All questions are compulsory.*
  - 2) *All questions carry equal marks.*
  - 3) *Black figures to the right indicate full marks.*
  - 4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in **2/3** lines :

- a) Define 'craton'.
- b) What are the tectonic elements of oceans ?
- c) Give economic importance of Singhbhum Shear Zone.
- d) Which is the host rock for Pb-Zn deposits at Zawar ?
- e) Give lithology of Salkhala Group.
- f) On which craton 'Sausar Group' is found ?
- g) Give regional trend of rocks belonging to Delhi Super group.
- h) Give name of the precambrian rocks of Eastern Himalayas.
- i) Give geographical location of 'Sakoli triangle'.
- j) Give the subdivisions of Vindhyan Supergroup in chronological order. **10**

2. Write notes on (**any two**) :

- a) Vaikrita Group
- b) Sittampundi Complex.
- c) Bhilwara Supergroup. **10**



3. Write notes on (**any two**) :

a) Bhima group

b) Closepet granite

c) Igneous activity in Singhbhum craton.

**10**

4. Give geographical distribution, stratigraphic succession and lithology of Dongargarh Super Group.

**10**

OR

4. Give geographical distribution, stratigraphic succession, lithology and economic importance of Cuddapah Super Group.

**10**

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**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**Paper – III : MICROBIOLOGY (2008 Pattern) (New Course)**  
**MB-333 : Enzymology**

Time : 2 Hours

Total Marks : 40

- N.B.:* 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labelled diagrams wherever necessary.*

1. Attempt the following : **10**

- a) For determination of amino acids at active site of an enzyme by alkylation \_\_\_\_\_ reagent is used.
- b) Name any two materials used for packing column in molecular sieve chromatography.
- c) What is meant by fold purification ?
- d) Define specific activity of an enzyme.
- e) State true or false – Lipoic acid is a cofactor of the pyruvate dehydrogenase.
- f) Define ligand and give one example.
- g) Define isozymes.
- h) Name any two materials used for immobilization of enzyme by adsorption.
- i) Give two examples of zymogens.
- j) Give any two applications of immobilized enzymes.

2. Attempt **any two** of the following : **10**

- a) Explain chemical modification of amino acid side chains as a method for determination of amino acids at active site of an enzyme.
- b) Describe effect of pH and temperature on enzyme catalyzed reaction.
- c) Explain covalent modification of an enzyme.

**P.T.O.**



3. Attempt **any two** of the following : **10**

- a) Explain role of biotin as a coenzyme.
- b) Describe enzyme assay by manometry.
- c) Describe any two types of feed back controls for enzyme regulation.

4. Attempt **any one** of the following : **10**

- a) Enlist the types of reversible inhibition and derive equation for competitive inhibition.
- b) Explain enzyme purification by
  - i) Ion exchange chromatography
  - ii) Solvent precipitation.

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**MICROBIOLOGY (Paper – IV)**  
**MB – 334 : Immunology – I (New)**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- N.B. : 1) All questions are compulsory.*  
*2) All questions carry equal marks.*  
*3) Draw neat labelled diagrams wherever necessary.*

1. A) Match the following and rewrite : 5

- |                        |                            |
|------------------------|----------------------------|
| 1) Dendritic cell      | A) Adjuvant                |
| 2) Plasma cell         | B) Flexibility             |
| 3) Aluminium hydroxide | C) Antigen presenting cell |
| 4) Sandwich ELISA      | D) Ig secretion            |
| 5) Hinge Region        | E) Antigen detection       |

B) State **True** or **False** : 5

- 1) Prostaglandins are mediators of inflammation.
- 2) Agglutination inhibition test can be used for detection of haptens.
- 3) Alternate pathway of complement needs C1 to C9 factors.
- 4) Single Radial Immunodiffusion is used as a quantitative test.
- 5) Positive and negative selection of T lymphocytes take place in thymus.

2. Write short notes on **any two** : 10

- A) Biological functions of complement activation.
- B) Heavy chain gene organization.
- C) Rocket immunoelectrophoresis.

P.T.O.



3. Attempt **any two** : **10**

- A) Diagrammatically illustrate-structure of lymph node.
- B) Compare in tabular form-thymus dependent and independent antigens.
- C) Explain-formation of white blood cells.

4. Attempt **any one** : **10**

- A) Describe Innate Immunity in detail.
- B) Describe preparation of hybridoma secreting monoclonal antibodies. Enlist applications of monoclonal antibodies.

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**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**MICROBIOLOGY (Paper –VI) (New Course)**  
**MB – 336 : Food and Dairy Microbiology (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- i) All questions are compulsory.*
  - ii) All questions carry equal marks.*
  - iii) Draw neat labelled diagrams wherever necessary.*

1. Answer the following :

10

- a) Define :
  - i) Skimmed milk.
  - ii) Asepsis.
- b) Write causative agent of brucellosis.
- c) Write long form of NDDDB.
- d) What is water activity ?
- e) Pseudomonas syncyanea causes \_\_\_\_\_ cd or in spoiled milk.
  - i) Yellow
  - ii) Red
  - iii) Black
  - iv) Blue
- f) Write substrate and reagents used in phosphatase test.
- g) A. Flavus causes \_\_\_\_\_ type of food poisoning.
- h) O-R Potential is a extrinsic factor of food.  
(State **True/False**)
- i) List organisms responsible for TA spoilage.

P.T.O.



2. Attempt the following (**any two**) : **10**
- a) Describe principle and methodology of Mastitis test.
  - b) Describe pasteurization of milk by HTST.
  - c) Describe spoilage of bread.
3. Write short notes on **any two** : **10**
- a) Stormy fermentation.
  - b) Preservation by canning.
  - c) Fermented foods.
4. Attempt **any one** of the following : **10**
- a) Describe food infection by Salmonella and Vibrio Parahaemolyticus with respect to sources and prevention.
  - b) Explain use of low temperature in food preservation.



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**ELECTRONIC SCIENCE**  
**EL – 332 : Microcontrollers (Paper – II)**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
 2) *Neat diagrams must be drawn wherever necessary.*  
 3) *Figures to the right indicate full marks.*  
 4) *Use of calculator is allowed.*

1. Answer **all** of the following :

- |   |   |
|---|---|
| a) If an address bus for a microcontroller has 16 lines, what is the maximum amount of memory it can access ? | 1 |
| b) Which register of 8051 $\mu$ c holds the address of the next instruction to be fetched ?                   | 1 |
| c) How many keys can be interfaced to $\mu$ c 8051 without multiplexing using a single 8 bit port ?           | 1 |
| d) Upon power on reset, what is content of PC ?   | 1 |
| e) What do you mean by $16 \times 2$ LCD ?  | 1 |
| f) What is the difference between RET and RETI instructions ?   | 2 |
| g) State any two applications of microcontroller.   | 1 |
| h) What is baud rate ? Which timer of $\mu$ c 8051 is used to set the baud rate ?                             | 2 |
| i) State four fields of assembly language instruction.  | 2 |

2. Answer **any two** of the following :

- |   |   |
|---|---|
| a) List the different addressing modes of 8051 $\mu$ c and explain any two with one example of each.    | 4 |
| b) Write a program to convert decimal number to its hexadecimal equivalent.                             | 4 |
| c) Interface 8 bit DAC to 8051 $\mu$ c and write a program to generate square wave with 50% duty cycle. | 4 |

P.T.O.



3. Answer **any two** of the following :
- a) List the timers of 8051  $\mu$ c. Explain the different modes of timer. 4
  - b) List the instructions by which accumulator can be cleared. Explain any two with suitable example. 4
  - c) Interface 8 k byte RAM to 8051  $\mu$ c. Give its memory map. 4
4. Answer **any two** of the following :
- a) Explain any three development tools used for programming of 8051  $\mu$ c. 6
  - b) Draw the internal architecture of 8051  $\mu$ c and explain it. 6
  - c) Draw a flowchart and write a program to find largest number out of given numbers in an array. The array starts from external RAM location 3001H. The length of array is stored in external RAM location 3000H. 6

OR

4. Answer **all** of the following :
- a) With XTAL = 11.0592 MHz, find the TH1 value needed to have following baud rates.
    - i) 9600 ii) 2400 4
  - b) Show the stack and stack pointer for the following. Assume the default stack area.
    - MOV R<sub>6</sub>, # 52H
    - MOV R<sub>1</sub>, # 21H
    - MOV R<sub>4</sub>, # 3FH
    - PUSH 06H
    - PUSH 01H
    - PUSH 04H 4
  - c) Show the status of Cy, AC and P flags after execution of the following instructions.
    - MOV A, # 9CH
    - ADD A, # 64H. 4



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**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**ELECTRONIC SCIENCE**  
**EL – 334 : Foundation of Nanoelectronics (Paper – IV)**  
**(2008 Pattern) (New Course)**

Time: 2 Hours

Max. Marks: 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Neat diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*  
4) *Log table/calculator is allowed.*

Given :  $m = 9.11 \times 10^{-31}$  kg.  
 $h = 6.625 \times 10^{-34}$  Js.

1. Attempt **all** of the following :

- |  |   |
|--|---|
| a) What is photoresist ? State its two types.                | 1 |
| b) State different distribution law in classical statistics. | 1 |
| c) State uncertainty principle.                              | 1 |
| d) Write Schrodinger's time independent equation.            | 1 |
| e) State importance of nanotechnology.                       | 2 |
| f) What do you mean by distribution function ?               | 2 |
| g) State the reasons of collisions of electrons in solids.   | 2 |
| h) What is quantum dot ?                                     | 2 |

2. Attempt **any two** of the following :

- |   |   |
|---|---|
| a) Derive the equation of continuity.   | 4 |
| b) Write Maxwell's equation in differential and integral form.                  | 4 |
| c) Obtain Maxwell-Boltzman approximation from Fermi-Dirac probability function. | 4 |

P.T.O.



3. Attempt **any two** of the following :

- a) Explain the phenomena of electron transport in nanostructure. **4**
- b) Describe the construction of resonant-tunneling diode with proper diagram. **4**
- c) Explain the construction of quantum wire. **4**

4. Attempt **any two** of the following :

- a) What is polarization ? Explain in brief
  - i) Plane polarization **6**
  - ii) Elliptical polarization **6**
- b) Describe the electron transport in quantum well. **6**
- c) Explain the electron transport in quantum wire. **6**

OR

4. Attempt **all** of the following :

- a) What is the smallest possible uncertainty in position of an electron moving with velocity  $10^6$  m/s ? **4**
- b) Calculate the wavelength associated with a particle of mass 2 gm moving with velocity 3 km/sec. **4**
- c) Calculate the value of poynting vector at the surface of sun if the power radiated by the sun is  $3.8 \times 10^{26}$  watts, while its radius is  $7 \times 10^8$  m. **4**



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES Paper – II**  
**DS – 332 : Defence Economics (New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B.:* i) *All questions are compulsory.*  
ii) *Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
- 1) Define “Perspectives in Defence Planning”.
  - 2) What do you mean by “Economic mobilisation for National defence” ?
  - 3) Define Ideology.
  - 4) Explain meaning of ‘Management Control’.
  - 5) What do you mean by Wartime Economy ?
  - 6) Write any two characteristics of modern warfare.
  - 7) Explain meaning of Economic warfare.
  - 8) What do you mean by deficit finance ?
2. Answer in **8 to 10** sentences each (**any two**) : **8**
- 1) Explain sources of Finance allocation of national resources.
  - 2) Discuss importance of price control during war.
  - 3) Explain scope of Economic warfare.
3. Write short notes on (**any two**) : **8**
- 1) “Economic mobilisation for National defence”.
  - 2) Determinants of Defence Expenditure.
  - 3) Characteristics of Indian Economy.
4. Answer in **16 to 20** sentences (**any one**) : **8**
- 1) Write a note on India’s defence Planning and Budgeting.
  - 2) Explain Domestic and Foreign Sources of War Finance.



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**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**ENVIRONMENTAL SCIENCES (Paper – I)**  
**ENV 301 : Terrestrial Ecosystems and Management (New)**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- Instructions.* :1) *All questions are compulsory.*  
2) *Neat and labeled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
- a) What are biomes ?
  - b) What is antibiosis (amensalism) ?
  - c) Define remote sensing.
  - d) Edge effect-Define.
  - e) Terms (names) for grassland biomes in different geographical regions.
  - f) Give geographical extents of western ghats.
  - g) Define tropical rain forests.
  - h) Enlist physico-chemical characteristics due to which variations are observed in terrestrial eco system.
  - i) Explain Belt-trasact in brief.
  - j) Kinds of Tundra Biome.
2. Write a short note on (any **two**) : **10**
- a) Highlights of process for Eco-restoration of surface mine area.
  - b) Forest fire : Causes and control measures.
  - c) Coniferous forests.

P.T.O.



3. Answer **any two** from the following : **10**
- a) General structure of terrestrial communities.
  - b) Explain the role of Nitrogen cycle in circulation of nutrients in Eco-system.
  - c) Describe the medicinal services of terrestrial ecosystem.
4. Attempt **any one** of the following question : **10**
- a) Describe the features of desert habitat and adaptation of desert animals.
  - b) Give a detail account of forest types of India with one example for each type.

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**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**( Paper – II) ENVIRONMENTAL SCIENCES**  
**ENV – 302 (New) : Wildlife Biology (2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- Instructions :* 1) *All questions are compulsory.*  
2) *Neat and labeled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
- Define wildlife biology.
  - Enlist major groups of animals.
  - What are Gymnosperms ?
  - Enlist the threatened birds of India.
  - What is habitat destruction ?
  - Define remote sensing.
  - What is quadrat sampling ?
  - Mention the biodiversity hotspots in India.
  - Define mangroves.
  - What are protected areas ?
2. Write a short note on (**any two**) : **10**
- Mammalian diversity and its habitats in India.
  - Camera trapping.
  - Application of remote sensing in wildlife monitoring.
3. Answer **any two** from the following : **10**
- Describe the environmental factors responsible for distribution of major groups of plants ?
  - What is vegetation ? Describe the major types of vegetation in India.
  - Describe the threats to wildlife in India.
4. Attempt **any one** of the following question : **10**
- What are the wildlife management techniques ? Explain the population assessment techniques for insects and birds.
  - What are the levels of biodiversity ? Describe the methods for conservation of genetic resources.





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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**Biotechnology (Vocational)**  
**PLANT BIOTECHNOLOGY (Paper – V) (2008 Pattern)**  
**(Voc. Biotech. – 335)**

Time : 2 Hours

Max. Marks : 40

*Instructions:* 1) *All questions are compulsory.*  
2) *Black figures to the right indicate full marks.*  
3) *Draw neat diagrams wherever necessary.*

1. Answer **each** of the following : **10**
- a) What is plant tissue culture ?
  - b) Give one cause for somaclonal variation.
  - c) Define somatic embryogenesis.
  - d) What are secondary metabolites ?
  - e) Define haploids.
  - f) Enlist two methods of gene transfer.
  - g) What is cryopreservation ?
  - h) Give one example of medicinal plant species.
  - i) Give the full form of GM food.
  - j) What is biofarming ?
2. Answer **any two** of the following : **10**
- a) Comment on advantages and disadvantages of somaclonal variation.
  - b) How are secondary metabolites produced ? Add a note on limitations of secondary metabolites.
  - c) Comment on micropropagation of endangered species.
3. Write short notes on **any two** of the following : **10**
- a) Transgenic plants.
  - b) Detection of haploids.
  - c) Ex-situ conservation of germplasm.
4. What is anther culture ? Comment on uses of haploids in plant breeding. **10**

OR

Comment on Artificial seed production with suitable examples.



**T.Y. B.Sc. Examination, 2010**  
**ELECTRONIC EQUIPMENT AND MAINTENANCE**  
**(Vocational) (Paper – V) (Sem. – III)**  
**Electronic Equipment Trouble Shooting and Repairs**  
**(2008 Pattern) (New Course)**

Time: 2 Hours

Max. Marks: 40

- Instructions :* 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of log tables, calculators is allowed.*

1. Answer the following : (3×4=12)
- a) Answer the following : (4×1=4)
- i) Define the term 'equipment failure'.
- ii) What are intermittent faults ?
- iii) State the formula for finding out number of checks to be done for n sequential stages using split-half method.
- iv) Give two examples of divergent circuits.
- b) Answer the following : (2×2=4)
- i) What may be the fault in a full-wave rectifier if all components are normal but there is no dc output.
- ii) Why is fault in a logic gate not obvious from output alone ?
- c) Comment on the following : (2×2=4)
- i) Cold test of a power supply must be done before hot test.
- ii) Inductor is called a wattless component.
2. Answer **any two** of the following : (2×4=8)
- a) Explain the working of logic current tracer. What is its use ?
- b) Explain the following steps in trouble shooting :
- Physical inspection.
- Identification of faulty section.
- c) Explain common faults in capacitors.

P.T.O.



3. Answer **any two** of the following : (2×4=8)
- Give troubleshooting procedure for power supply units.
  - Give block diagram of DMM and explain following faults in it.
    - One range of voltage is non operative, other ranges normal.
    - Calibration of meter is faulty.
  - Explain the flow chart for fault model of digital circuits.

4. Answer the following : (2×6=12)
- Explain the following causes of equipment failure :
    - Poor design
    - Production deficiencies
  - Explain the working of following controls in CRO :
    - Focus
    - Level
- Give the causes of following faults :
- Vertical deflection inadequate
  - Start of input signal waveform not visible.

OR

4. Answer the following : (3×4=12)
- In an op-amp inverting amplifier  $R_f = 15 \text{ k}\Omega$  and  $R_1 = 1.5 \text{ k}\Omega$ . If  $V_{in} = 5 \text{ mV}$  dc, what will be normal voltages at inverting input and output terminals ? What will they be if  $R_f$  is open ?
  - What are ideal values of line and load regulation ? For a voltage regulator dc output voltage is 4.92 volt and 5 volt for ac input voltages 230 V and 250 V, Find its % line regulation.
  - Use the truth table method to find test vectors for different faults in an AND gate with 3 inputs (lines 1, 2, 3 are inputs and line 4 is output).
-

**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**Electronic Equipment and Maintenance (Paper – VI)**

**Vocational**

**ELECTRONIC INSTRUMENTATION (New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagrams wherever necessary.*

1. a) Answer the following : (4×1=4)  
i) What are primary transducers ?  
ii) Give one example of auxiliary element in an instrumentation system.  
iii) Define – ‘accuracy’. Give mathematical formula for it.  
iv) What do you mean by ‘impedance’ ?
- b) Answer the following : (2×2=4)  
i) State different types of amplifiers used in instrumentation system.  
ii) What are ‘dynamometers’ ? State the types.
- c) Comment on the following : (2×2=4)  
i) Null-type instruments are comparatively more accurate than corresponding deflection type instruments.  
ii) Instrument with 1% accuracy is considered better than that with 2% accuracy.
2. Answer the following (any 2) : (2×4=8)  
i) Give a brief account on ‘digital phase meter’.  
ii) Explain the characteristic of ‘traceability’ with suitable example.  
iii) Write a short note on ‘digital signal processing’.
3. Answer the following (any 2) : (2×4=8)  
i) Explain ‘logic analyzer’.  
ii) Discuss ‘the absorption dynamometer’.  
iii) Explain ‘digital LCR bridge’.



4. Answer the following : (2×6=12)
- i) With a block diagram explain microprocessor based instrumentation system.
  - ii) Define 'load cell' and explain 'the hydraulic load cell'.

OR

4. Solve the following : (2×6=12)
- i) A voltmeter having sensitivity  $1000 \Omega/V$  reads 100V on its 150V scale when connected across an unknown resistor in series with a milliammeter ; that reads 5mA. Calculate (a) apparent resistance (b) actual resistance (c) loading error.
  - ii) It is desired to measure the temperature using a thermistor with  $\beta = 314^\circ K$ . Its resistance at  $27^\circ C$  is known to be  $1050 \Omega$ . What will be the temperature when its resistance becomes  $2330 \Omega$  ?

\_\_\_\_\_



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**MATHEMATICS (Paper – I)**  
**MT-331 : Set Theory and Logic**  
**(2008-Pattern) (New Course)**

Time: 2 Hours

Max. Marks: 40

*N.B. : 1) All questions are compulsory.*  
*2) Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

- i) Show that  $\neg(p \vee q)$  and  $\neg p \wedge \neg q$  are logically equivalent.
- ii) Let  $P(x)$  be the statement “ $x = x^2$ ” where domain is the set of all integers. Write truth value of (a)  $\exists x P(x)$  (b)  $\forall x P(x)$ .
- iii) Write the inverse and contrapositive of the statement “If  $3n + 2$  is odd, then  $n$  is odd”.
- iv) Give an example of sets  $A, B, C$  such that  $A \in B, B \not\subseteq C$  and  $A \in C$ .
- v) State the Schröder-Bernstein theorem.
- vi) Show that  $(0, 1] \sim [0, 1)$ .
- vii) Show that the empty set  $\phi$  is a subset of any set  $A$ .

2. Attempt **any two** of the following : **10**

- i) If  $\rho$  and  $\sigma$  are equivalence relations on  $X$  then show that  $\rho \cap \sigma$  is an equivalence relation on  $X$ . Is  $\rho \cup \sigma$ , an equivalence relation on  $X$  ? Justify.
- ii) If  $\langle x, y \rangle = \langle u, v \rangle$ , then show that  $x = u, y = v$ .
- iii) Prove that a function  $f : X \rightarrow Y$  is one-one if and only if for any  $A, B \subseteq X, f(A \cap B) = f(A) \cap f(B)$ .



3. Attempt **any two** of the following :

10

i) Show that the hypothesis “It is not sunny this afternoon and it is colder than yesterday”, “We will go swimming only if it is sunny”. “If we do not go swimming, then we will take a canoe trip,” and “If we take canoe trip, then we will be at home by sunset” lead to the conclusion “We will be at home by sunset”.

ii) Show that  $\neg\forall x(P(x) \rightarrow Q(x))$  and  $\exists x(P(x) \wedge \neg Q(x))$  are logically equivalent.

iii) Define the terms : Theorem, lemma, corollary, conjecture and trivial proof.

4. Attempt **any one** of the following :

10

i) a) Prove that  $\mathbb{N} \times \mathbb{N}$  is countable.

b) Prove that if  $n$  is an integer then  $n^2 \geq n$ .

ii) a) If  $n$  is a finite cardinal then show that  $n < \aleph_0$ .

b) Use quantifiers and predicates to express the fact that  $\lim_{x \rightarrow a} f(x)$  doesn't exist

where expression doesn't contain  $\neg$  connective. ( $\lim_{x \rightarrow a} f(x) = L$  exists if for any given  $\varepsilon > 0$ , there exists  $\delta > 0$  such that  $|f(x) - L| < \varepsilon$  whenever  $0 < |x - a| < \delta$ )



**T. Y. B.Sc. (Sem. – III) Examination, 2010**  
**MATHEMATICS (Paper – II)**  
**MT-332 Real Analysis**  
**(New Course) (2008 – Pattern)**

Time: 2 Hours

Max. Marks: 40

*N.B. : 1) All questions are compulsory.*  
*2) Figures to the right indicate full marks.*

1. Attempt **any five** of the following :

**10**

i) Find the limit superior and limit inferior of the sequence  $\left\{ \sin \frac{n\pi}{2} \right\}_{n=1}^{\infty}$ .

ii) Show that following series is conditionally convergent  $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$

iii) Discuss the convergence of the series  $\sum_{n=2}^{\infty} \frac{1}{(\log n)^n}$ .

iv) Let  $f(x) = x$  ( $0 \leq x \leq 1$ ) and  $\delta = \left\{ 0, \frac{1}{3}, \frac{2}{3}, 1 \right\}$  be a partition of  $[0,1]$ , compute  $U[f, \delta]$ .

v) If  $f \in R[a,b]$   $g \in R[a,b]$  then prove that  $f+g \in R[a,b]$ .

vi) Find the limit function of the sequence  $\{f_n\}_{n=1}^{\infty}$ . Where  $f_n(x) = x^n$  ( $0 \leq x \leq 1$ ).

vii) State the conditions under which  $\sum_{n=1}^{\infty} u_n(x)$  can be differentiated term by term.

2. Attempt **any two** of the following :

**10**

i) If  $\sum_{n=1}^{\infty} a_n$  is series of non-zero real numbers and if  $A = \lim_{n \rightarrow \infty} \sup \left| \frac{a_{n+1}}{a_n} \right|$  then

prove that  $\sum_{n=1}^{\infty} |a_n| < \infty$  provided  $A < 1$ .

**P.T.O.**





ii) Using definition show that the sequence  $\{s_n\}_{n=1}^\infty$  is a Cauchy sequence where

$$s_n = \frac{n-1}{n+1}.$$

iii) State Cauchy condensation test for convergence of series of real numbers

and use it to test the convergence of  $\sum_{n=4}^\infty \frac{1}{n(\log n)^2}$ .

3. Attempt **any two** of the following :

10

i) If  $f$  is a continuous function on a closed and bounded interval  $[a,b]$  and

if  $\phi'(x) = f(x)$  ( $a \leq x \leq b$ ) then prove that  $\int_a^b f(x) dx = \phi(b) - \phi(a)$ .

ii) If  $f$  is continuous on  $[0,1]$  then prove that  $\int_0^1 f(x) dx = \lim_{n \rightarrow \infty} \left[ \frac{1}{n} \sum_{k=1}^n f\left(\frac{k}{n}\right) \right]$ .

iii) Prove that  $\frac{\pi^2}{2a} \leq \int_0^\pi \frac{x dx}{a \cos^2 \frac{x}{2} + b \sin^2 \frac{x}{2}} \leq \frac{\pi^2}{2b}$  ( $a > b$ ).

4. Attempt **any one** of the following :

10

i) If  $\sum_{k=1}^\infty U_k(x)$  is series of Riemann integrable functions on  $[a,b]$  which converges uniformly to  $f(x)$  on  $[a,b]$  then prove that  $f$  is Riemann integrable on  $[a,b]$

and  $\int_a^b f(x) dx = \sum_{k=1}^\infty \int_a^b U_k(x) dx$  Hence show that  $\int_0^1 \left[ \sum_{n=1}^\infty \frac{x^n}{n^2} \right] dx = \sum_{n=1}^\infty \frac{1}{n^2(n+1)}$

ii) a) Show that the sequence  $\{f_n\}_{n=1}^\infty$  where  $f_n(x) = \frac{x}{1+nx}$  ( $0 \leq x < \infty$ ) converges uniformly to 0 on  $[0, \infty]$ .

4

b) Show that series  $\sum_{n=1}^\infty \frac{x}{n^p + n^q x^2}$  for an  $x \in \mathbb{R}$  is uniformly convergent if  $p+q > 2$ .

6



[3817] – 303

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**MATHEMATICS (Paper – III)**  
**MT-333 : Problem Course Based on MT-331 and MT-332**  
**(2008-Pattern : New Course)**

Time: 2 Hours

Max. Marks: 40

- N.B. :*
- 1) *All questions are compulsory.*
  - 2) *Figures to the right indicate full marks.*
  - 3) *Answers to the two Sections should be written in separate answer books.*
  - 4) *Tie answer books of both the Sections together.*

SECTION – I

(Set Theory and Logic)

1. A) Attempt **any three** of the following : **6**
- i) Give an example of a relation which is reflexive, symmetric but not transitive.
  - ii) If A is uncountable and B is denumerable, then show that  $A - B$  is uncountable.
  - iii) How many rows appear in the truth table for the compound proposition  $(p \wedge r \wedge s) \vee (q \wedge t) \vee (r \wedge \neg t)$  ?
  - iv) Prove that if m and n are integers and mn is even, then m is even or n is even.
- B) Attempt **any one** of the following : **4**
- i) For sets A, B and C show that  $A \times (B \cap C) = (A \times B) \cap (A \times C)$ .
  - ii) Show that set of all positive rational numbers  $Q^+$  is countable.

P.T.O.



2. Attempt **any two** of the following :

10

- i) Without using truth tables show that  $(p \wedge q) \rightarrow (p \vee q)$  is a tautology.
- ii) Show that  $p \oplus q \equiv \neg(p \leftrightarrow q)$ , where  $\oplus$  is exclusive or.
- iii) Let  $L(x, y)$  be the statement “x loves y,” where domain for both x and y consists of all people in the world. Use quantifiers to express each of these statements.
  - a) Everybody loves Jerry.
  - b) Everybody loves somebody.
  - c) There is somebody whom everybody loves.
  - d) Nobody loves everybody.
  - e) There is somebody whom Dolly does not love.

### SECTION – II

3. A) Attempt **any three** of the following :

6

- i) Give an example of sequences  $\{s_n\}_{n=1}^{\infty}$  and  $\{t_n\}_{n=1}^{\infty}$  to show that

$$\limsup_{n \rightarrow \infty} (s_n + t_n) \neq \limsup_{n \rightarrow \infty} s_n + \limsup_{n \rightarrow \infty} t_n .$$

- ii) Does the series  $\frac{1}{2} - \frac{2}{3} + \frac{3}{4} - \frac{4}{5} + \dots$  converge ? Justify.

- iii) If  $f$  is defined on  $[0, 1]$  such that  $f(x) = \begin{cases} 1 & x \neq 1/2 \\ 0 & x = 1/2 \end{cases}$ .

Is  $f \in R[0, 1]$  ? Justify.

- iv) Prove that  $\sum_{n=1}^{\infty} \frac{1}{n^2 + x^2}$  is uniformly convergent on  $(0, \infty)$ .



B) Attempt **any one** of the following :

4

i) Show that the sequence  $\{f_n\}_{n=1}^\infty$  where  $f_n(x) = \frac{1}{n}e^{-nx}$  ( $0 \leq x < \infty$ ) converges uniformly on  $(0, \infty)$ .

ii) Show that  $\int_0^\pi \left[ \sum_{n=1}^\infty \frac{\sin nx}{n^2} \right] dx = \sum_{n=1}^\infty \frac{2}{(2n-1)^3}$ .

4. Attempt **any two** of the following :

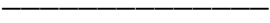
10

i) Discuss the convergence of the following series.

a)  $\sum_{n=1}^\infty \frac{x^n}{n^n}$       b)  $\sum_{n=1}^\infty \frac{n^n}{n!}$ .

ii) If  $f$  and  $g$  are continuous functions on  $[a, b]$  and  $g(t) \geq 0$  ( $a \leq t \leq b$ ) then prove that there exist  $c \in (a, b)$  such that  $\int_a^b f(x)g(x)dx = f(c) \int_a^b g(x)dx$ .

iii) Evaluate  $\lim_{n \rightarrow \infty} \frac{1}{n} \left[ \sin \frac{\pi}{n} + \sin \frac{2\pi}{n} + \dots + \sin \frac{n\pi}{n} \right]$ .





**T.Y.B.Sc. (Sem. – III) Examination, 2010**  
**MATHEMATICS (Paper – VII) (2008 Pattern)**  
**MT – 337 Elective - D : Differential Geometry (New Course)**

Time: 2 Hours

Max. Marks: 40

*N.B. : 1) All questions are compulsory.*  
*2) Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

- i) For the logarithmic spiral  $\bar{\gamma}(t) = (e^t \cos t, e^t \sin t)$ , show that the angle between  $\bar{\gamma}(t)$  and the tangent vector at  $\bar{\gamma}(t)$  is independent of  $t$ .
- ii) State isoperimetric inequality for plane curves. When does equality hold ?
- iii) Let  $\bar{\gamma}(u)$  be a unit speed plane curve and  $\hat{a}$  be a unit vector perpendicular to the plane containing  $\bar{\gamma}(u)$ . Find the first fundamental form of the surface.  
$$\sigma(u, v) = \bar{\gamma}(u) + v\hat{a}.$$
- iv) Show that every isometry is a conformal map.
- v) Show that if  $f(x, y)$  is a smooth functions, its graph  $\{(x, y, z) \in \mathbb{R}^3 \mid z = f(x, y)\}$  is a smooth surface.
- vi) Show that  $\bar{\gamma}_1(t) = (t, t^2)$  and  $\bar{\gamma}_2(t) = (t^3, t^6)$  are parametrizations of the parabola  $y = x^2$ . Further, show that  $\bar{\gamma}_2(t)$  is not a reparametrization of  $\bar{\gamma}_1(t)$ .
- vii) Define vertex of a curve  $\bar{\gamma}(t)$  in  $\mathbb{R}^2$ . If  $\bar{\gamma}(t)$  is a simple closed convex curve in  $\mathbb{R}^2$  then how many minimum number of vertices does it have ?

2. Attempt **any two** of the following : **10**

- i) Let  $\bar{\gamma}(t)$  be a regular curve in  $\mathbb{R}^3$ . Prove that its curvature is

$$k = \frac{\|\ddot{\gamma} \times \dot{\gamma}\|}{\|\dot{\gamma}\|^3}$$

where  $\times$  indicates the vector (or cross) product and the dot denotes  $\frac{d}{dt}$ .

P.T.O.



ii) Define a reparametrization of a parametrized curve  $\gamma : (\alpha, \beta) \rightarrow \mathbb{R}^n$ . When do you say that a point  $\gamma(t)$  of the curve  $\gamma$  is a regular point? Prove that any reparametrization of a regular curve is regular.

iii) Show that  $\bar{\gamma}(t) = (\cos^2 t - \frac{1}{2}, \sin t \cos t, \sin t)$  is a parametrization of the curve of intersection of the circular cylinder of radius  $\frac{1}{2}$  and axis the z-axis with the sphere of radius 1 and centre  $(\frac{-1}{2}, 0, 0)$ .

3. Attempt **any two** of the following : 10

i) State and prove Meusnier's theorem.

ii) The second fundamental form of a surface patch  $\sigma$  is zero everywhere. Prove that  $\sigma$  is part of a plane.

iii) Let  $U_1$  and  $U_2$  be open subsets of  $\mathbb{R}^2$  and let  $\sigma : U_1 \rightarrow \mathbb{R}^3$  be a regular surface patch. Let  $\phi : U_2 \rightarrow U_1$  be a bijective smooth map with smooth inverse map  $\phi^{-1} : U_1 \rightarrow U_2$ . Then, prove that  $\sigma \circ \phi : U_2 \rightarrow \mathbb{R}^3$  is a regular surface patch.

4. Attempt **any one** of the following :

i) a) Let  $\bar{\gamma}(s)$  and  $\bar{\gamma}_1(s)$  be two unit-speed curves in  $\mathbb{R}^3$  with the same curvature and the same torsion  $\tau(s)$  for all  $s$ . Prove that there is a rigid motion  $M$  of  $\mathbb{R}^3$  such that  $\bar{\gamma}_1(s) = M(\bar{\gamma}(s))$  for all  $s$ . 8

b) Show that if a curve on a surface has zero normal and geodesic curvature everywhere, it is part of a straight line. 2

ii) a) Let  $F : [0, \pi] \rightarrow \mathbb{R}$  be a smooth function such that  $F(0) = F(\pi) = 0$ . Then prove that

$$\int_0^\pi \left( \frac{dF}{dt} \right)^2 dt \geq \int_0^\pi F(t)^2 dt$$

Further, show that equality holds if and only if  $F(t) = A \sin t$  for all  $t \in [0, \pi]$ , where  $A$  is a constant. 6

b) Show that the quadric  $x^2 + 2y^2 + 6x - 4y + 3z = 7$  is a smooth surface with an atlas consisting of the single surface patch. 4



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**CHEMISTRY (Paper – IV)**  
**CH – 334 : Analytical Chemistry**  
**(2008 New Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :*
- 1) All questions are *compulsory*.
  - 2) Figures to the *right* indicate *full* marks.
  - 3) *Use of log tables and calculators is allowed.*
  - 4) *Neat diagram must be drawn wherever necessary.*

1. Answer the following :

10

- 1) Draw the structure of cupferron.
- 2) Define the term overpotential in electrogravimetry.
- 3) State Lambert's law.
- 4) Define the term 'Faraday'.
- 5) What is molar extinction coefficient ?
- 6) What is role of monochromator in AAS ?
- 7) What do you mean by hollow cathode lamp used in AAS ?
- 8) Give Boltzmann equation in FES.
- 9) Define flame emission spectroscopy.
- 10) Calculate turbidity if transmittance  $T = 0.675$ .

2. a) Solve **any two** of the following :

6

- 1) Define the term electrochemical equivalent. State and explain Faraday's laws of electrolysis.
- 2) Explain mole ratio method in the study of complexes.
- 3) Explain the principle of nephelometer and turbidimeter.

P.T.O.



b) Solve **any two** of the following : 4

- 1) Explain the effect of acid on solubility of precipitate.
- 2) If 3.0 ampere of current is passed through silver nitrate solution for 30 min. calculate the weight of silver deposited.  
[Electrochemical eq. of silver =  $1.118 \times 10^{-3}$ ].
- 3) The molar absorptivity of particular solute is  $2.1 \times 10^3$ . Calculate transmittance through a cuvette with 3 cm light path having concentration  $2.5 \times 10^{-6}$ M.

3. Answer **any two** of the following : 10

- 1) What is gravimetric analysis ? Describe condition for good precipitation.
- 2) With the help of block diagram describe the instrumentation of AAS.
- 3) Describe in brief applications of FES.

4. a) What is thermogravimetry ? Give its classification. Explain different factors affecting thermogravimetric curve. 6

OR

a) i) Draw schematic diagram of single beam spectrophotometer and explain essential parts in brief. 3

ii) Explain construction and working of the turbidimeter. 3

b) A light absorbed by a  $3.5 \times 10^{-3}$  M solution of a substance was found to be 30% at  $\lambda$  max when placed in a cell of unit path length. Find absorbance, molar absorptivity and transmittance if conc. of solution and path length are doubled. 4

OR

b) If the precipitate of  $\text{PbSO}_4$  is washed with 250 ml of water. Calculate how many gram of precipitate will be lost during washing operation.

Given :  $K_{sp}$  of  $\text{PbSO}_4 = 2.124 \times 10^{-6}$

Atomic Wt.of Pb = 207, S = 32, O = 16. 4





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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**BOTANY (Paper – I) (New Course) (2008 Pattern)**  
**BO. 331, Algae, Fungi and Bryophyt**

Time: 2 Hours

Max. Marks: 40

*Instructions : 1) All questions are compulsory.*

*2) Draw neat labelled diagrams wherever necessary.*

*3) Figures to the right indicate full marks.*

I. Answer the following :

**10**

- a) Give any two distinguishing characters of algae.
- b) Name the pigments in Rhodophyta.
- c) Mention the type of thallus in Nostoc.
- d) Give one example of Bacillariophyta.
- e) What are mycorrhiza ?
- f) Write two general characters of ascomycetes.
- g) Give any one use of Saccharomyces.
- h) Write two general characters of hepaticopsida.
- i) Give any two uses of bryophytes.
- j) Write any two examples of Anthocerotopsida.

**P.T.O.**



II. Attempt **any two** of the following : **10**

- a) Give an outline classification of fungi up to class level as proposed by Ainsworth et al (1973).
- b) Describe any two types of thalli in Chlorophyta.
- c) Sketch, label and describe the internal structure of thallus in Marchantia.

III. Write notes on **any two** : **10**

- a) Archegonial branch in Polytrichum.
- b) Structure of thallus in myxomycetes.
- c) Sporophyte in Anthoceros.

IV. Give taxonomic position, thallus structure and reproduction in Batrachospermum. **10**

OR

Give systematic position, thallus structure and reproduction in Rhizopus. **10**



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**BOTANY (Paper – IV)**  
**BO – 334 : Genetics and Plant Breeding**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*Instructions :* i) All questions are **compulsory**.  
ii) Figures to the **right** indicate **full** marks.  
iii) Draw **neat** labelled diagrams **wherever** necessary.

1. Answer the following : **10**
- a) Define complementary gene interaction.
  - b) What is dihybrid cross ?
  - c) Define alleles.
  - d) What is cytoplasmic inheritance ?
  - e) Define sex-linked inheritance.
  - f) Enlist any two quantitative characters.
  - g) What are spontaneous mutations ?
  - h) Define plant breeding.
  - i) What is mass selection ?
  - j) Define mutation breeding.
2. Answer **any two** of the following : **10**
- a) What are duplicate genes ? Explain 15 : 1 ratio with a suitable example.
  - b) Explain balance concept of sex determination in Drosophila.
  - c) What is heterosis ? Explain dominance hypothesis.

**P.T.O.**



3. Write notes on (**any two**) : **10**

- a) Multiple alleles in human blood groups.
- b) Detection of linkage from  $F_2$  data and test cross.
- c) Advantages and disadvantages of plant introduction.

4. What is polyploidy ? Explain origin and effects of allopolyploidy. **10**

OR

What is hybridization ? Explain various steps involved in the procedure of hybridization. **10**



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**T.Y. B.Sc. (Semester – III) Examination 2010**  
**ZOOLOGY (Paper – II) (2008 Pattern)**  
**Zy – 332 : Mammalians Histology**  
**(New-Course)**

Time: 2 Hours

Max. Marks: 40

- N.B. : 1) All questions are compulsory.*  
*2) Neat labelled diagrams must be drawn wherever necessary.*  
*3) Figures to the right indicate full marks.*

1. Attempt the following :

**10**

- 1) What are cells of Leydig ?
- 2) Mention various layers of artery.
- 3) Give name of any one compound tubulo-alveolar gland.
- 4) What are Kupffer cells ?
- 5) What is filiform papilla ?
- 6) What is goblet cell ?
- 7) What is merocrine secretion ?
- 8) Mention the components of Juxta-Glomerular complex.
- 9) What is significance of PAS reaction ?
- 10) Define connective tissue.

2. Attempt **any two** of the following :

**10**

- i) Describe histological structure of pancreas.
- ii) Sketch and label V.S. through tooth.
- iii) Describe histological structure of taste-bud.

**P.T.O.**



3. Write notes on **any two** : **10**
- a) Histological structure of adrenal cortex.
  - b) Sketch and label V.S. through skin.
  - c) L.S. through kidney.
  - d) Scope of Histology.
4. Describe histological structure of ovary. **10**
- OR
4. Describe histological structure of duodenum. **10**
-



[3817] – 337

**T.Y.B.Sc. (Semester – III) Examination, 2010**  
**ZOOLOGY (Paper – VI)**  
**ZY – 336 : Cell Biology (New Course)**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

- N.B. :** i) *All questions are compulsory.*  
ii) *Neat labelled diagrams must be drawn wherever necessary.*  
iii) *Figures to the right indicate full marks.*

1. Attempt the following :

**10**

- 1) Define cell biology.
- 2) What are desmosomes ?
- 3) What are phagocytic vacuoles ?
- 4) What is cell to cell contact ?
- 5) Define necrobiosis.
- 6) What is apocrine mode of secretion ?
- 7) What is karyokinesis ?
- 8) What are microtubules ?
- 9) What is autolysis ?
- 10) What is centriole ?

2. Attempt **any two** of the following :

**10**

- i) Differentiate between mitosis and meiosis.
- ii) Describe ultrastructure of mitochondria.
- iii) Describe the structure of nucleopore.

**P.T.O.**



3. Write notes on **any two** : **10**
- a) Nucleocytoplasmic interactions
  - b) Functions of lysosomes
  - c) Functions of endoplasmic reticulum
  - d) Causes of cancer.
4. Describe intracellular changes during cell ageing. **10**

OR

Describe the Danielli-Dawson model of plasma membrane and add a note on transport mechanisms across membrane. **10**





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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**MICROBIOLOGY (Paper – I) (New Course)**  
**MB – 331 : Medical Microbiology – I (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. : 1) All questions are compulsory.*  
*2) All questions carry equal marks.*  
*3) Draw neat labelled diagram wherever necessary.*

1. Answer in **one** or **two** sentences :

- A) 1) What is difference between source and reservoir of infections ?  
2) Name the phagocytic cells in liver.  
3) Enlist any two toxins produced by Cl. tetani.  
4) Name the causative agent of Q. fever.  
5) Enlist any two complications of Strep. Pyogens.

B) Match the following :

- |                |  |
|----------------|--|
| 1) Pseudomonas | a) Thyer-Martin agar                     |
| 2) Treponema   | b) Cetrinide agar                        |
| 3) Clostridium | c) Co-cultivation with tissue culture    |
| 4) Salmonella  | d) Robertsons cooked meat media          |
| 5) Neisseria   | e) Wilson blairs bismuth sulphite medium |

2. Attempt **any two** :

- 1) Describe defence mechanism of Gastrointestinal system and name any three organisms causing Gastroenteritis.  
2) Enlist direct and indirect modes of transmission of communicable diseases.  
3) Explain in detail pathogenesis of disease Leptospirosis.

P.T.O.



3. Comment on (**any two**) :

- 1) Cultivation of Rickettsia
- 2) Classification of Vibrio.
- 3) Disease Anthrax with reference to
  - i) Prophylaxis
  - ii) Treatment.

4. Attempt **any one** :

A) Describe pathogenecity of disease caused by Pneumococci.

OR

B) Explain laboratory diagnosis of Tuberculosis.



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**ELECTRONIC SCIENCE (Paper – I)**  
**EL – 331 : Advanced Digital Systems Design**  
**(2008 Pattern)(New)**

Time : 2 Hours

Max. Marks : 40

- N.B :*
- i) All questions are compulsory.*
  - ii) Neat diagrams must be drawn wherever necessary.*
  - iii) Figures to the right indicate full marks.*
  - iv) Use of calculator is allowed.*

1. Answer **all** of the following :

- a) What do you mean by equivalence states ? 1
- b) Determine no, of I/Ps, O/Ps and type of output for PAL16L8. 1
- c) State any one advantage of Asynchronous Sequential machine. 1
- d) What is sequential logic circuit ? 1
- e) “Flow tables are used in synchronous sequential circuit design” comment. 2
- f) How many state assignment permutations are possible with two state and three state variables ? 2
- g) “Schottky technique is used to reduce the power dissipation” comment. 2
- h) Write entity declaration for 2 to 4 line Decoder in VHDL. 2

2. Answer **any two** of the following :

- a) What is combinational logic circuit ? List the various general steps for designing digital system. 4

P.T.O.



- b) What is state reduction technique ? Write its advantages. Explain the procedure of equivalence class reduction technique in short. **4**
- c) Explain fundamental mode Asynchronous sequential circuit. **4**
3. Answer **any two** of the following :
- a) Explain CPLD with the help of neat block diagram. **4**
- b) Explain critical and non critical races of Asynchronous sequential circuit with suitable example. **4**
- c) What is incompletely specified state table for sequential circuit ? Draw the merger graph by assuming any suitable incompletely specified state table. **4**
4. Answer **any two** of the following :
- a) With the help of block diagram, explain working of Traffic light controller. **6**
- b) Explain critical race free shared row state assignment technique for asynchronous sequential machine. **6**
- c) i) Write a short note on FPGA,  
 ii) Explain simple synchronising circuit for asynchronous data inputs to a synchronous system. **6**
- OR
4. Answer the following : **4**
- a) A combinational logical expressions
- $$F_1 = x_1 x_2 + x_1 \bar{x}_3 + \bar{x}_1 \bar{x}_2 x_3$$
- $$F_5 = x_1 x_3 + \bar{x}_1 x_2 \bar{x}_3 + x_1 \bar{x}_2 \bar{x}_3$$
- Implement the circuit with PAL.



- b) Write VHDL program for JK flipflop using Behavioral modeling. 4
- c) Reduce the following state table using implication chart. 4

Present State	Next State		Output	
	x = 0	x = 1	x = 0	x = 1
S <sub>0</sub>	S <sub>2</sub>	S <sub>1</sub>	0	1
S <sub>1</sub>	S <sub>3</sub>	S <sub>1</sub>	0	1
S <sub>2</sub>	S <sub>0</sub>	S <sub>3</sub>	1	0
S <sub>3</sub>	S <sub>1</sub>	S <sub>2</sub>	1	0

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – IX)**  
**DS-339 (A) : Defence Management in India**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B.:* 1) *All the questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences **each** : **16**
- 1) Define Defence Management.
  - 2) State the meaning of industrial military complex.
  - 3) What do you mean by Team building ?
  - 4) Explain the meaning of career management.
  - 5) Define leadership.
  - 6) What do you mean by Battle dynamism ?
  - 7) Explain the meaning of ‘Strategy of Tomorrow’.
  - 8) Who wrote the book entitled, “Management in the Armed Forces” ?
2. Answer in **8 to 10** sentences (**any two**) : **8**
- 1) Explain scope of management.
  - 2) Discuss application of war principles in corporate management.
  - 3) Discuss role of leadership in the defence management.
3. Write short notes on (**any two**) : **8**
- 1) Principles of management.
  - 2) Human resource management in the Armed Forces.
  - 3) Defence management in India.
4. Answer in **16 to 20** sentences (**any one**) : **8**
- 1) Write a note on similarity of industrial and military concept of management.
  - 2) Explain role of leadership in the Battle field.

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P.T.O.



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – IX)**  
**DS-339 (B) : Internal Security of India – I (New)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B.: 1) All the questions are compulsory.*  
*2) Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences **each** : **16**
    - 1) Define security.
    - 2) Define Ethnic conflict.
    - 3) Define 'Terrorism'.
    - 4) What do you mean by organised crime ?
    - 5) Explain the meaning of Human Security.
    - 6) What do you mean by SEZ ?
    - 7) State any two characteristics of North-East India.
    - 8) What do you mean by 'Naxalite Movement' ?
  
  2. Answer in **8 to 10** sentences (**any two**) : **8**
    - 1) Explain Elements of the state.
    - 2) Discuss socio-economic dimension of internal security.
    - 3) Write a note on organised crime in India.
  
  3. Write short notes on (**any two**) : **8**
    - 1) External abetment.
    - 2) Role of the State in Human Security.
    - 3) Agitations over development issues.
  
  4. Write in **16 to 20** sentences (**any one**) : **8**
    - 1) Explain security challenges to North-East Region of India.
    - 2) Discuss internal security problems of India with reference to Kashmir scenario.
-





**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – IX)**  
**DS-339 (C) : India's Maritence Security – I**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B.: 1) All the questions are compulsory.*  
*2) Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences **each** : **16**
- 1) Define geo-politics.
  - 2) Explain the meaning of maritence elements.
  - 3) State the meaning of Navigational aids.
  - 4) Define sea power.
  - 5) What do you mean by Executive Economic Zone (EEZ) ?
  - 6) Write any two functions of Navy during peace time.
  - 7) State the meaning of fixed asset of Navy.
  - 8) What do you mean by continental shelf ?
2. Answer in **8 to 10** sentences (**any two**) : **8**
- 1) Explain the concept of maritime boundaries.
  - 2) Discuss the role of coast guard.
  - 3) Explain brief history of ocean.
3. Write short notes on (**any two**) : **8**
- 1) Maritime resources.
  - 2) India's military maritime strategy.
  - 3) Continental shelf.
4. Write in **16 to 20** sentences (**any one**) : **8**
- 1) Explain role of sea-power in modern war.
  - 2) Discuss the role of Navy in the management of India's National Security.



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**T.Y.B.Sc. (Semester – III) (New) Examination, 2010**  
**COMPUTER HARDWARE & NETWORK ADMINISTRATION – V**  
**Computer/IT Service Management and Entrepreneurship Development**  
**(Vocational)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

1. Attempt **all** in **one/two** sentences. **(1×10=10)**

- 1) What is CoBIT ?
- 2) CIO stands for –
- 3) “System Administrator can also be a Database Administrator”. State whether true or false.
- 4) What is a RFP ?
- 5) What do you mean by Hardware Requirement ?
- 6) What is Escalation ?
- 7) What is a SLA ?
- 8) What is an incident ?
- 9) Where does change management process exists ?
- 10) Name any one ISO standard for Information Security.

2. Attempt **any two** of the following : **(5×2=10)**

- 1) Explain the significance of segregation of duties.
- 2) How do we prepare an Invitation to Tender ?
- 3) Write a note on problem management.

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3. Attempt **any two** of the following : **(5×2=10)**

- 1) Write a note on software licensing issues.
- 2) Explain the importance of a Help Desk.
- 3) List any five access controls with suitable examples.

4. Attempt **any one** of the following : **(10×1=10)**

- 1) How will you do a requirement study for an institute having 100 students and 20 computers ?

OR

- 2) a) Explain the functions of IS audit.  
b) What is a change management Process ?

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**INDUSTRIAL MICROBIOLOGY (Paper – VI)**  
**VOC-IND-MIC-336 : Animal and Plant Tissue Culture**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) *Neat diagrams must be drawn wherever necessary.*
  - 2) *Black figures to the right indicate full marks.*
  - 3) *All questions carry equal marks.*
  - 4) *Use of logarithmic tables slide rule. Mollier charts, electronic pocket calculator and steam tables is allowed.*
  - 5) *Assume suitable data, if necessary.*
  - 6) *All questions are compulsory.*

1. Answer as directed :

10

A) Choose the right answer :

- i) Vero cell line is prepared from \_\_\_\_\_  
a) Plants                      b) Human                      c) Mouse                      d) Monkey
- ii) Shoots can be regenerated by a process called as \_\_\_\_\_  
a) Rhizogenesis                      b) Histogenesis  
c) Caulogenesis                      d) Cytodifferentiation
- iii) Cytokinin essential for somatic embryogenesis is \_\_\_\_\_  
a) 2, 4-Dichlorophenoxy acetic acid  
b) 3-indole butyric acid  
c) Nicotinic acid  
d) Zeatin

B) State **true / false** :

- i) Colchicine treatment produces diploid cells in pollen culture thro. the process of meiotic arrest.
- ii) In HAT medium 'A' stands for amoxycillins.



C) Define the following :

- i) Somatic embryogenesis
- ii) Gene therapy.

D) Give any two examples of animal cell culture products with application.

E) What is cybrid ?

F) State the purpose of trypsinisation of tissue.

2. Answer **any two** of the following :

**10**

- i) Write short note on artificial seeds.
- ii) Comment on protoplast fusion technique.
- iii) What is In Vitro Fertilization ?

3. Write short note on **any two** of the following :

**10**

- a) Steps involved in setting up primary culture.
- b) Hybridoma technology.
- c) Suspension culture in animal tissue culture.

4. Comment on “Dolly the transgenic clone”.

OR

Give major types of media in PTC with important constituents and their functions. **10**

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**MATHEMATICS (Paper – IV)**  
**MT – 334 : Group Theory**  
**(2008 Pattern) (New Course)**

Time: 2 Hours

Max. Marks: 40

*N.B. : 1) All questions are compulsory.*  
*2) Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**
- i) Let  $G$  be a finite group with identity element  $e$ . Show that if  $a \in G$  then there exists a natural number  $n$  such that  $a^n = e$ .
  - ii) If  $G$  is a group then prove that for all  $a, b \in G$   $(ab)^{-1} = b^{-1}a^{-1}$ .
  - iii) Compute the product  $(1, 2, 4, 7)(2, 3, 5, 7)$  in  $S_7$ .
  - iv) If  $H$  and  $K$  are subgroups of a group  $G$  then show that  $H \cap K$  is a subgroup of  $G$ .
  - v) If  $\phi$  is a homomorphism of  $G$  into  $\overline{G}$ , then prove that  $(\phi(x))^{-1} = \phi(x^{-1})$  for all  $x \in G$ .
  - vi) Show that every subgroup of an abelian group is normal.
  - vii) Show that every cyclic group is an abelian group.
2. Attempt **any two** of the following : **10**
- i) Let  $\phi$  be a group homomorphism of  $G$  into  $\overline{G}$  with kernel  $K$ . Prove that  $K$  is a normal subgroup of  $G$ .
  - ii) If every element of the group  $G$  is its own inverse then show that  $G$  is an abelian group.
  - iii) If  $G$  is a group in which  $(a.b)^i = a^i b^i$  for three consecutive integers  $i$  for all  $a, b \in G$ , show that  $G$  is abelian.



3. Attempt **any two** of the following : **10**
- i) Let  $G$  be a finite group and  $H$  be a subgroup of  $G$ . Prove that order of  $H$  is a divisor of order of  $G$ .
  - ii) Prove that there is no  $a$  in  $S_8$ , such that  $a^{-1} (1, 2, 3) a = (1, 3) (5, 7, 8)$ .
  - iii) Let  $H$  be a subgroup of group  $G$  and  $N(H) = \{a \in G \mid aHa^{-1} = H\}$   
Prove that  $N(H)$  is a subgroup of  $G$ .
4. Attempt **any one** of the following :
- i) a) Prove that every group is isomorphic to a subgroup of  $A(S)$ , the group of permutations, for some appropriate  $S$ . **6**
  - b) Suppose  $N$  and  $M$  are two normal subgroups of  $G$  and that  $N \cap M = \{e\}$ , show that for any  $n \in N$ ,  $m \in M$ ,  $nm = mn$ . **4**
  - ii) a) Prove that a subgroup  $N$  of  $G$  is a normal subgroup of  $G$  if and only if every left coset of  $N$  in  $G$  is a right coset of  $N$  in  $G$ . **6**
  - b) If  $G$  is a finite group whose order is a prime number then prove that  $G$  is a cyclic group. **4**
-



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**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**(2008 Pattern)**  
**MATHEMATICS (Paper – V)**  
**MT – 335 : Ordinary Differential Equations**  
**(New Course)**

Time : 2 Hours

Max. Marks : 40

*N.B. :* 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

i) Solve  $e^y dx + (xe^y + 2y) dy = 0$ .

ii) Show that the solutions  $x = e^{4t}$ ,  $y = e^{4t}$  and  $x = e^{-2t}$ ,  $y = -e^{-2t}$  of the following system

$$\frac{dx}{dt} = x + 3y$$

$$\frac{dy}{dt} = 3x + y$$

are linearly independent and write the general solution of the system.

iii) Solve  $2 \frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + 3y = 0$ .

iv) Find the particular solution that satisfies the given initial conditions.

$$\frac{dy}{dx} = 2 \sin x \cos x ; \text{ when } x = 0, y = 1.$$

v) Find the singular point of differential equation

$$(1 + x^2) \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 0. \text{ Verify that } 0 \text{ is an ordinary point.}$$

P.T.O.





vi) Show that the series  $y = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$  satisfies the differential equation  $\frac{d^2y}{dx^2} = -y$ .

vii) Verify that  $y = x^2$  is one solution of  $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - 4y = 0$ .

2. Attempt **any two** of the following :

**10**

i) Explain the method of solving linear differential equation

$$\frac{dy}{dx} + P(x)y = Q(x) .$$

ii) Solve  $(x^3 + y^3) dx - xy^2 dy = 0$ .

iii) Solve  $ydx + (2x - ye^y) dy = 0$ .

3. Attempt **any two** of the following :

**10**

i) Explain the method of solving the linear non-homogeneous differential equation

$$\frac{d^2y}{dx^2} + P(x) \frac{dy}{dx} + Q(x) y = R(x) \text{ by using variation of parameter.}$$

ii) Use the method of reduction of order to solve the differential equation

$$y \frac{d^2y}{dx^2} - \left( \frac{dy}{dx} \right)^2 = 0 .$$

iii) Solve the differential equation  $\frac{d^2y}{dx^2} + 3 \frac{dy}{dx} - 10y = 6e^{4x}$  by method of undetermined coefficient.



4. Attempt **any one** of the following :

**10**

i) a) Find the power series solution of differential equation  $\frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = 0$ .

b) The differential equation  $\frac{d^2y}{dx^2} + y = 0$  has the series solution of the form

$y = \sum_{j=0}^{\infty} a_j x^j$ . Show that the coefficient  $a_j$  are related by recursion formula

$$a_{j+2} = \frac{-a_j}{(j+1)(j+2)}, j = 0, 1, 2, \dots$$

ii) a) If  $W(t)$  is the Wronskian of the two solutions of the homogeneous system of differential equations, then prove that  $W(t)$  is either identically zero or nowhere zero on  $[a, b]$ .

b) Solve the system of differential equations.

$$\frac{dx}{dt} = -4x - y$$

$$\frac{dy}{dt} = x - 2y.$$

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**MATHEMATICS (Paper – VI)**  
**MT – 336 : Problem Course Based on MT – 334 and MT – 335**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*  
 2) *Figures to the right indicate full marks.*  
 3) *Answers to the two Sections should be written in separate answer books.*  
 4) *Tie answerbooks of both the Sections together.*

SECTION – I  
 (Group Theory)

1. a) Attempt **any three** of the following : **6**
- i) Find all the cosets of the subgroup  $4\mathbb{Z}$  of  $2\mathbb{Z}$ . Hence, show that  $4\mathbb{Z}$  is a normal subgroup of  $2\mathbb{Z}$ .
  - ii) Is  $\mathbb{Z}_4$  isomorphic to Klein's 4 group ? Justify.
  - iii) Let  $G$  be an abelian group and  $\phi : G \rightarrow G$  be defined by  $\phi(x) = x^{-1} \forall x \in G$ . Prove that  $\phi$  is a one-one homomorphism.
  - iv) Let  $U_{12}$  denote the integers relatively prime to 12 under multiplication mod 12. Write the group multiplication table of  $U_{12}$ .
- b) Attempt **any one** of the following : **4**
- i) If  $N$  and  $M$  are normal subgroups of a group  $G$ , then prove that  $NM$  is also a normal subgroup of  $G$ .
  - ii) Compute  $a^{-1}ba$ , where  $a = (1, 3, 2)$  and  $b = (1, 5, 7, 9)$ .

P.T.O.



2. Attempt **any two** of the following :

10

i) If in a group  $G$ ,  $a^5 = e$  and  $aba^{-1} = b^2$  for some  $a, b \in G$ , find  $O(b)$ .

ii) Let  $G$  be the group of all  $2 \times 2$  matrices with real coefficients having non-zero

determinant under matrix multiplication. Suppose  $H = \left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} \mid ad - bc = 1 \right\}$ .

Show that :

I)  $H$  is a subgroup of  $G$  and

II)  $H$  is a normal subgroup of  $G$ .

iii) Let  $(\mathbb{C}^*, \cdot)$  and  $(\mathbb{R}^*, \cdot)$  denote the group of non-zero complex numbers and non-zero real numbers under multiplication. Give an example of an onto homomorphism from  $(\mathbb{C}^*, \cdot)$  to  $(\mathbb{R}^*, \cdot)$ . Find Kernel of the homomorphism.

SECTION – II  
(Ordinary Differential Equations)

3. A) Attempt **any three** of the following :

6

i) Find the integrating factor of differential equation  $(xy - 1) dx + (x^2 - xy) dy = 0$ .

ii) Solve the differential equation

$$x \frac{dy}{dx} + y = x^4$$

iii) Show that  $x = 2e^{4t}$ ,  $y = 3e^{4t}$  and  $x = e^{-t}$ ,  $y = -e^{-t}$  are solutions of the homogeneous system

$$\frac{dx}{dt} = x + 2y$$

$$\frac{dy}{dt} = 3x + 2y.$$

iv) Find the general solution of the differential equation  $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$ .



B) Attempt **any one** of the following : **4**

i) Find the orthogonal trajectories of family of curves  $y = C(x^2 + 1)$ .

ii) Find the particular solution of the differential equation

$$\frac{dy}{dx} - 2xy = 6xe^x \text{ when } x = 1, y = 1.$$

4. Attempt **any two** of the following : **10**

i) Find the power series solution of differential equation  $\frac{dy}{dx} + y = 1$ . Verify your conclusion by solving the differential equation directly.

ii) Solve the system of differential equation  $\frac{dx}{dt} = x + y$

$$\frac{dy}{dt} = 4x - 2y .$$

iii) Solve the differential equation

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = \frac{1}{(1 + e^{-x})} \text{ by using method of variation of parameter.}$$



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**MT – 337 (C) (Elective) : MATHEMATICS (Paper – VII)**  
**(2008 Pattern) (New Course)**  
**C- Programming – I**

Time : 2 Hours

Max. Marks : 40

*N.B. : i) All questions are compulsory.*  
*ii) Figures to the **right** indicate **full** marks.*

1. Attempt **any five** of the following : **10**
- i) Determine which of the following are valid character constants ? Justify.
    - a) '\101'                      b) 'xy'
  - ii) What is the difference between '2' and "2" ?
  - iii) Find the value of the following expression :  
 $10/2 * 5 + 5\% 2 * 3 - 7.$
  - iv) Explain the meaning of each of the following function declarations :  
int f (int a);  
void g (int a, float b) ;
  - v) Determine which of the following are valid integer constants ? Justify.
    - a) 0789                      b) 23 E + 02
  - vi) Define a one-dimensional, four-element character array called 'letter'. Assign the characters 'N', 'S' 'E' and 'W' to the array element.
  - vii) State two advantages of the use of functions.
2. Attempt **any two** of the following : **10**
- i) Write a note on while loop.
  - ii) Write a note on if-else statement and conditional operator.
  - iii) Define a function to find gcd of two integers.

**P.T.O.**



3. Attempt **any two** of the following : **10**
- i) Write a note on one-dimensional array.
  - ii) Explain the use of printf function.
  - iii) Write a program to reverse a string.

4. Attempt **any one** of the following : **10**
- i) a) Define a function to find n !  
b) Explain the use of break; statement.
  - ii) a) Explain the use of scanf function.  
b) Describe the output generated by the following C-program.

```
# include <stdio.h>
int main (){
    int i, j, a [ ] [3] = {3, 4, 5, 6, 7, 9};
    for (i = 0; i < 2; i ++ ) {
        for ( j = 0; j < 3; j++)
            printf ("%d", a[i] [j]);
        print f {"\n"};
    }
}
```



**T. Y. B.Sc. (Sem. – III) Examination, 2010**  
**MATHEMATICS : Paper – VII**  
**MT-337 (Elective – E) : Combinatorics**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

*N.B.:* 1) All questions are **compulsory**.  
2) Figures to the **right** indicate **full** marks.

1. Attempt **any five** of the following : **10**
- i) Determine the number of non empty collections of letters that can be formed from 3 A's and 5 B's.
  - ii) How many numbers greater than 3,000,000 can be formed by arrangements of 1, 2, 2, 4, 6, 6, 6 ?
  - iii) How many non-negative integer solutions are there to the equation  
$$x_1 + x_2 + x_3 + x_4 + x_5 = 28$$
 with  $x_i \geq 1, i = 1, 2, 3, 4, 5$ .
  - iv) How many ways are there to seat 5 different boys and 5 different girls around a circular table with 10 seats, if boys and girls alternate seats ?
  - v) Find the roots of the characteristic equation associated with the recurrence relation  $a_n = 2a_{n-1} + 3a_{n-2}$ , for  $n > 2$ .
  - vi) Determine the number of positive integers that are factors of 300.
  - vii) How many ways are there to distribute three different teddy bears and nine identical lollipops to four children without restrictions ?





2. Attempt **any two** of the following : **10**

i) Show by a combinatorial argument, that  $\binom{2n}{2} = 2 \binom{n}{2} + n^2$ .

ii) Find the coefficient of  $x^5$  in the expansion of  $(1 + 3x + 2x^2)^4$ .

iii) How many  $n$ -digit decimal sequences (using 0, 1, 2, ..., 9) are there in which the digits 1, 2, 3 all appear ?

3. Attempt **any two** of the following : **10**

i) Prove that in any set of seven distinct integers, there exist two integers whose sum or difference is a multiple of 10.

ii) Solve the recurrence relation :

$$a_n = 2a_{n-1} - a_{n-2}, \quad a_0 = a_1 = 2.$$

iii) Prove that the number of selections with repetitions of  $r$  objects chosen from

$$n \text{ types of objects is } \binom{r+n-1}{r}.$$

4. Attempt **any one** of the following : **10**

i) a) How many integer solutions are there to the equation

$$x_1 + x_2 + x_3 + x_4 = 30, \quad 0 \leq x_i \leq 10, \quad i = 1, 2, 3, 4. \quad \mathbf{6}$$

b) Find a recurrence relation for the number of ways to arrange cars in a row with  $n$  spaces if we can use Cadillacs or Continentals or Fords. A Cadillac or Continental requires two spaces, whereas a Ford requires just one space. **4**

ii) a) Find a general solution to the recurrence relation. **6**

$$a_n - 5a_{n-1} + 6a_{n-2} = 2 + 3n.$$

b) How many arrangements of the digits 0, 1, 2, ..., 9 are there in which the first digit is greater than 1 and last digit is less than 8 ? **4**



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**PHYSICS (Paper – IV) (New) (2008 Pattern)**  
**PH – 334 : Atomic and Molecular Physics**

Time: 2 Hours

Max. Marks: 40

- Instructions** : 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of log tables and calculator is allowed.*  
4) *Draw neat diagram wherever necessary.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) Give any one basic feature of vector atom model.
  - b) What are antistokes line ?
  - c) What are x-rays ?
  - d) Write atomic state if  $L = 1, S = 1/2$ .
  - e) What is third postulates of Bohr's theory ?
  - f) What is Zeeman effect ?
  - g) What is multiplicity of state ?
  - h) State any two application of Raman Spectra ?
  - i) State Duane and Hunt law.
  - j) Define Bohr magneton.
2. Attempt **any two** of the following :
- a) Explain Raman effect on the basis of quantum theory. **5**
  - b) Explain LS and jj coupling with the help of vector diagram. **5**
  - c) Give the comparison between x-ray spectra and optical spectra. **5**

P.T.O.



3. Attempt **any two** of the following :

a) In normal Zeeman effect, show that three possible lines are given by

$$\nu = \nu_0 + \Delta m_l \frac{eH}{4\pi m} \text{ where symbols have their usual meanings.} \quad 5$$

b) Discuss in detail Stern-Gerlach experiment. 5

c) Show that energy of rigid diatomic molecule is given by an expression

$$E_J = \frac{h^2 J(J+1)}{8\pi^2 I}. \quad 5$$

4. A) Attempt **any one** of the following :

i) Obtain singlet-triplet separations in terms of interaction energies of two valence electron atom in p-f configuration using L-S coupling. 8

ii) Obtain an expression for vibrational energy levels of diatomic molecule. Show that energy levels of harmonic oscillator are equally spaced. 8

B) Attempt **any one** of the following :

i) What is Raman Shift ? 2

ii) Find orbital angular momentum of a electron (Given  $h = 6.63 \times 10^{-34} \text{Js}$ ). 2

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**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**BOTANY (Paper – V)**  
**BO - 335 : Biometry and Computer Applications**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** i) *All questions are compulsory.*  
ii) *Draw neat labelled diagram wherever necessary.*  
iii) *Figures to the right indicate full marks.*

1. Answer the following : 10
    - a) Define mean.
    - b) What is data ?
    - c) Define Event.
    - d) What is probability ?
    - e) Define server.
    - f) Define ALU.
    - g) What is desktop ?
    - h) What is WAN ?
    - i) What is computer ?
    - j) Define memory.
  
  2. Attempt **any two** of the following : 10
    - a) Describe Histograms.
    - b) Comment on Task bar
    - c) Give importance of modem in net working.
  
  3. Write short notes on **any two** of the following : 10
    - a) Continuous-variable
    - b) Advantages of computer networking.
    - c) Applications of windows.
  
  4. What is binomial distribution and write its properties ? 10
- OR
4. Write applications of MS Excel. 10
-



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**T.Y. B.Sc. (Sem. – III) (New Course) Examination, 2010**  
**GL – 332 : GEOLOGY (Paper – II)**  
**Igneous Petrology (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :* 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Black figures to the right indicate full marks.*  
4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in 2-3 lines : **10**

- a) Which process of magmatic evolution produces Xenoliths ?
- b) Crystallisation of Leucite-Silica system is an example of which type of crystallisation ?
- c) Name the mineral which crystallises first in the discontinuous series of Bowen's reaction series.
- d) Define Magmatic contamination.
- e) What is meant by flow differentiation ?
- f) What is 'ophitic texture' ?
- g) Name the rock which exhibits ropy structure.
- h) Name any one acidic magma.
- i) Under which tectonic setting is the basaltic magma generated ?
- j) What is the basis for classification of igneous rocks according to Shand ?

2. Answer the following (**any two**) : **10**

- a) Generation of hot plumes
- b) Selective nucleation
- c) Significance of glomero-porphyritic texture.

**P.T.O.**

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3. Write notes on (**any two**) : **10**
- a) Origin and mineral composition of peridotites
  - b) Contaminated Granites
  - c) Gravitational settling.
4. Describe in detail, the crystallisation of Ab-An-Di system and its significance. **10**

OR

- Write notes on : **10**
- a) Crystallisation of Fo-Fa system
  - b) Mixing of magmas.

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*B/II/10/255*



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**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**GEOLOGY (Paper – IV)**  
**GL – 334 : Structural Geology**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- Instructions :*
- 1) *All questions are compulsory.*
  - 2) *All questions carry equal marks.*
  - 3) *Black figures to the right indicate full marks.*
  - 4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in **2/3** lines.

**10**

- a) What is “Plastic deformation” ?
- b) Define schistosity.
- c) Define “Primary lineations”.
- d) Define “Tensile Stress”.
- e) What are Bedding cleavages ?
- f) Define flexure-slip folding.
- g) What are slicken-sides ?
- h) Explain Rieckie’s principle.
- i) Define the differential force of torsion.
- j) What is meant by “Lithostatic pressure” ?

2. Write notes on **(any two)** :

**10**

- a) Composition of forces.
- b) Extension and release fractures.
- c) Fatigue curve.

**P.T.O.**



3. Write notes on (**any two**) : **10**
- a) Slaty cleavages.
  - b) Relation between strain and stress ellipsoid.
  - c) Intragranular movements.
4. State and explain with neat diagrams mechanics of gravity, thrust and strike-slip faulting. **10**

OR

4. a) Describe composition of salt domes and add a note on their economic importance.
- b) Explain origin of folds by tectonic movements. **10**

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**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**GEOLOGY (New Course)**  
**Paper – VI – GL 336 : Applied Geology – I**  
**(Field Geology, Remote Sensing)**  
**(2008 Pattern)**

Time : 2 Hours

Total Marks : 40

- N.B. :*
- 1) *All questions are compulsory.*
  - 2) *All questions carry equal marks.*
  - 3) *Black figures to the right indicate full marks.*
  - 4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in **2/3** lines :

**10**

- a) What is eruptive contact ?
- b) Give any two likely places of exposures.
- c) What is white body ?
- d) What is principal point ?
- e) What is spectral bandwidth of thermal IR ?
- f) What is area feature ?
- g) What is tone of aerial photograph ?
- h) What is meant by attribute data ?
- i) Define sensor.
- j) What is hyperspectral scanner ?

2. Answer **any two** of the following :

**10**

- a) What are the applications of remote-sensing in ground water survey ?
- b) Explain Trellis drainage pattern and its significance.
- c) What are photogeologic characters of granite ?

**P.T.O.**



3. Answer **any two** of the following : **10**
- a) Briefly explain Landsat-7 satellite.
  - b) Discuss the importance of contacts during geological surveying.
  - c) Discuss the spectral characteristics of water bodies (clear and polluted) in visible and Near IR spectral bands.

4. Give a brief history of remote sensing satellites. **10**

OR

4. What do you mean by Global positioning system ? Explain the working of Global positioning system. **10**

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**STATISTICS (Principal)**  
**(Paper – I) ST - 331 : Distribution Theory – I**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of scientific calculator and statistical tables is allowed.*  
4) *Symbols and abbreviations have their usual meanings.*

1. Attempt **each** of the following :

a) Choose the correct alternative in each of the following : **(1 each)**

i) If  $(X_1, X_2, X_3) \sim MD (n = 20, p_1=0.4, p_2=0.3, p_3= 0.3)$ , then

A)  $E(X_1) < E(X_2) = E(X_3)$       B)  $E(X_1) > E(X_2) = E(X_3)$

C)  $E(X_1) = E(X_2) < E(X_3)$       D)  $E(X_1) < E(X_2) < E(X_3)$

ii) If  $X \sim \beta_2(m, n)$ , then mean of X is

A)  $\frac{m}{n-1}$                                       B)  $\frac{n}{m+1}$

C)  $\frac{n}{m-1}$                                       D)  $\frac{m}{n+1}$

iii) The probability density function of the first order statistic  $X_{(1)}$  is

A)  $n[1 - F(x)]^{n-1}f(x)$                       B)  $n[F(x)]^{n-1}f(x)$

C)  $n[1 - F(x)]^{n-1}$                               D)  $n[F(x)]^{n-1}$



iv) If  $X \sim W(\alpha, \beta)$ , then the distribution of  $Y = \left(\frac{X}{\alpha}\right)^\beta$  is

- A) Standard exponential      B) Uniform  $(\alpha, \beta)$   
 C) Standard normal          D) Normal  $(\alpha, \beta)$

b) State whether **each** of the following statements is **true** or **false** :      **(1 each)**

i) If  $X \sim MD(n, p_1, p_2, p_3)$ , then the conditional distribution of  $X_1$

given  $X_1 + X_2 = r$  is binomial with parameters  $r$  and  $\frac{p_1}{p_1 + p_2}$ .

ii) If  $X \sim \beta_1(m, n)$ , then  $\beta_1(1, 1)$  reduces to the standard normal distribution.

c) i) Define convergence in distribution.      **1**

ii) State the central limit theorem for independent and identically distributed random variables.      **1**

d) i) Give one real life situation where Weibull distribution is used.      **1**

ii) State the relationship of  $\beta_1(m, n)$  distribution with  $\beta_2(m, n)$  distribution.      **1**

2. Attempt **any two** of the following :      **(5 each)**

a) Let  $(X_1, X_2, \dots, X_k) \sim MD(n, p_1, p_2, \dots, p_k)$ . State the moment generating function of  $(X_1, X_2, \dots, X_k)$  and hence find covariance between  $X_1$  and  $X_2$ .

b) Let  $X \sim W(\alpha, \beta)$ . Obtain expression for mean and median of the distribution of  $X$ .

c) Let  $X$  and  $Y$  be two independent  $\beta_1(1, 1)$  variates. Obtain the distribution of  $U = X - Y$ .



3. Attempt **any two** of the following : (5 each)

a) State and prove Chebychev's inequality for continuous random variable. 5

b) i) State Weak Law of Large Number (WLLN). 2

ii) Using central limit theorem find the approximate probability that mean of a random sample of size 25 from a distribution having probability density function

$$f(x) = 3x^2, \quad 0 < x < 1$$
$$= 0, \quad \text{otherwise}$$

lies between  $\frac{3}{5}$  and  $\frac{4}{5}$ . 3

c) Three fair dice are cast. In 10 independent casts, let X be the number of times all three faces are alike and Y be the number of times only two faces are alike. Find the joint probability density function of X and Y and compute E (6 XY). 5

4. Attempt **any one** of the following :

a) i) Obtain joint probability density function of  $i^{\text{th}}$  and  $j^{\text{th}}$  order statistics for a random sample of size n from a continuous distribution. 7

ii) A discrete random variable X is such that  $E(X) = 3$  and  $E(X^2) = 13$ . What is the value of k which guarantees  $P(|X - 3| \leq k) \geq 0.99$  ? 3

b) i) If  $X_1, X_2, X_3$  is a random sample from  $U(0, 1)$ , find the probability density function of sample median (M). Also find  $E(M)$  and  $\text{Var}(M)$ . 6

ii) If  $X \sim \beta_1(m, n)$ , obtain harmonic mean of the distribution of X. 4



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**STATISTICS (Principal) (Paper – II)**  
**ST – 332 : Theory of Estimation (2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks: 40

- Instructions :**
- i) All questions are **compulsory**.
  - ii) Figures to the **right** indicate **full** marks.
  - iii) Use of scientific calculator and statistical tables is **allowed**.
  - iv) Symbols and abbreviations have their **usual** meanings.

1. Attempt **each** of the following :

a) In each of the following cases, choose the correct alternative : **(1 each)**

i) If  $T_1$  and  $T_2$  are the two mutually independent unbiased estimators of the parameter  $\theta$  then an unbiased estimator of  $\theta(1 - \theta)$  is given by

- A)  $T_1(1 - T_2)$       B)  $T_2(1 + T_1)$       C)  $T_1 - T_2$       D)  $T_1 T_2$

ii)  $X_1, X_2$  is a random sample (r.s.) from  $P(m)$ .

If  $T_1 = \frac{X_1 + 2X_2}{3}$  and  $T_2 = \frac{X_1 + X_2}{2}$  then efficiency of  $T_1$  in relation to  $T_2$  is

- A) 9/10      B) 10/9      C) 5/3      D) 3/5

iii) Pitman-Koopman form of probability distribution is used to determine \_\_\_\_\_ estimator of the parameter.

- A) unbiased      B) sufficient      C) efficient      D) consistent

iv) A biased estimator  $T$  is consistent for population parameter if the following condition is satisfied for the sample size  $n$  tending to infinity.

- A) Bias in  $T$  tends to zero  
B)  $V(T)$  tends to zero  
C) Bias in  $T$  and  $V(T)$  tend to zero  
D) Bias in  $T$  tends to zero and  $V(T)$  tends to one



b) In each of the following cases, state whether the given statement is **true** or **false** : (1 each)

- i) M.l.e. is always sufficient for the parameter.
- ii) There exists infinitely many unbiased estimators of parameter  $\lambda$  of a Poisson distribution.

c) Define the following terms : (1 each)

- i) UMVUE
- ii) Pivotal quantity

d) Explain the following terms : (1 each)

- i) Fisher's Information function
- ii) Confidence interval

2. Attempt **any two** of the following : (5 each)

a) A random variable  $X$  takes values 1 and 0 with respective probabilities  $\theta$  and  $(1 - \theta)$ . If  $X_1, X_2, \dots, X_n$  are  $n$  independent observations on  $X$ , show that

$$\frac{T(n - T)}{n(n - 1)} \text{ is an unbiased estimator of } \theta(1 - \theta), \text{ where } T = \sum_{i=1}^n X_i.$$

b)  $X_1, X_2, \dots, X_n$  is a r.s. of size  $n$  from a distribution with p.d.f.

$$\begin{aligned} f(x, \theta) &= e^{-(x-\theta)} \quad , \quad x > \theta, \quad -\infty < \theta < \infty \\ &= 0 \quad , \quad \text{elsewhere} \end{aligned}$$

Obtain a sufficient statistic for  $\theta$ .

c) For a gamma distribution with parameters  $(\alpha, \lambda)$ , find the asymptotic variance of m. l. e. of  $\alpha$  when  $\lambda$  is known.



3. Attempt **any two** of the following : (5 each)

a) On the basis of a random sample of size  $n$  from  $N(\mu, \delta^2)$ , obtain  $100(1 - \alpha)\%$  confidence interval for  $\delta^2$  when  $\mu$  is not known.

b)  $X_1, X_2, \dots, X_n$  is a r.s. from Bernoulli distribution with parameter  $\theta$ . Obtain MVBUE of  $\theta$  and find its variance.

c) A continuous random variable  $X$  has p.d.f.

$$f(x, \alpha) = \frac{1}{p+1} e^{-(x-\alpha)} (x-\alpha)^p, \quad \alpha \leq x < \infty, \alpha \in \mathbb{R}$$

$p$  – known .

Obtain moment estimator of  $\alpha$ .

4. Attempt **any one** of the following :

a) i)  $X_1, X_2, \dots, X_n$  is a r.s. from  $U(0, \theta)$ . Show that  $X_{(n)}$  is consistent estimator of  $\theta$ . 6

ii) State Cramer-Rao inequality along with the underlying assumptions. 4

b) i)  $X_1, X_2, \dots, X_n$  is a r.s. of size  $n$  from a distribution with mean  $\mu$  and variance

$$\delta^2. \text{ Let } \sum_{i=1}^n a_i = 1 \text{ where } a_i, i=1, 2, \dots, n \text{ are constants. Show that } T = \sum_{i=1}^n a_i X_i \text{ is}$$

an unbiased estimator of  $\mu$ . Find  $V(T)$  and show that it is minimum when

$$a_i = \frac{1}{n}, i=1, 2, \dots, n. \quad \text{6}$$

ii) With usual notations, prove that MVBUE of  $\theta$  satisfies the relation :

$$\frac{\partial}{\partial \theta} \log L = n I(\theta) (T - \theta). \quad \text{4}$$





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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**STATISTICS (Principal) (Paper – III)**  
**ST 333 : Statistical Process Control (Online Methods)**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- i) All questions are compulsory.*
  - ii) Figures to the **right** indicate **full** marks.*
  - iii) Use of scientific calculator and statistical tables is allowed.*
  - iv) Symbols and abbreviations have their usual meanings.*

1. Attempt **each** of the following :

a) Choose the correct alternative in **each** of the following : **(1 each)**

i) The process mean and process standard deviation are  $\mu_0$  and  $\sigma_0$  respectively. The UCL of  $\bar{X}$ -chart is

A)  $\mu_0 - 3\sigma_0$

B)  $\mu_0 + 3\sigma_0$

C)  $\mu_0 - \sigma_0$

D)  $\mu_0 + \frac{3\sigma_0}{\sqrt{n}}$

ii) The control limits are obtained using Poisson probability distribution for

A)  $\bar{X}$ -chart

B) C chart

C) CRL chart

D) X-MR chart

iii) In SPC, one always draws

A)  $\bar{X}$ -chart first and then R-chart

B) R-chart first and then  $\bar{X}$ -chart

C) both  $\bar{X}$  chart and R chart simultaneously

D) any one of the  $\bar{X}$  chart and R chart

P.T.O.





3. Attempt **any two** of the following : **(5 each)**

- a) i) Define  $C_p$  and  $C_{pk}$  for a stable process.  
ii) Distinguish between chance causes and assignable causes of variation.
- b) i) What do you mean by online methods in SPC ? State any illustration of it.  
ii) Write a note on ‘size of subgroups’.
- c) A process is being studied w.r.t. a fraction defectives control chart. The procedure consists of taking hourly samples of 50 items. The three sigma control limits are as  
 $LCL = 0.0524, UCL = 0.4102$   
If the process fraction defective shifts to 0.28, calculate the probability that this shift is
  - i) Not detected on the first sample after the shift
  - ii) Detected on the second sample after the shift. (Assume Normality)

4. Attempt **any one** of the following :

- a) i) Explain the construction and interpretation of p-chart by using stabilized control limits when subgroup sizes  $n_i$  are different and process fraction defective  $P$  is not known. **5**  
ii) Explain briefly the operating characteristic curve for  $\bar{X}$ -chart. (The quality characteristic  $X$  follows Normal probability distribution and the standard deviation  $\sigma$  of the process is known and is constant. Define Average Run Length (ARL). **5**
- b) i) Explain the construction and interpretation of R-chart when standards  $\mu$  and  $\sigma$  are not known. Explain the method of revision of such a R-chart if a point  $(j, R_j)$  falls above UCL. **6**



ii) Draw a Pareto Diagram for the following data of a manufacturing process and interpret it

4

Error code	Error	Count
E1	Electrode failure	13
E2	Unskilled operator	6
E3	reagents	30
E4	Colorimeter drift	38
E5	deformed tubing	14

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b) State whether each of the following statements is **true** or **false**. (1 each)

- i)  $L = \alpha_1 - 2\alpha_2 - 2\alpha_3$  is a linear contrast of treatment effects  $\alpha_1, \alpha_2, \alpha_3$ .
- ii) Efficiency of a design always lies between 0 and 1.

c) Define :

- i) Experimental unit. 1
- ii) Block. 1

d) i) Define concomitant variable in ANOCOVA giving one example. 1

- ii) Give layout of one replicate of a  $2^3$  factorial experiment where interaction BC is confounded. 1

2. Attempt **any two** of the following : (5 each)

- a) Describe the principles of replication and randomisation in design of experiments.
- b) State the mathematical model for an RBD. Give meanings of notation used and state assumptions. Show that in an RBD, mean S.S. due to error is an unbiased estimator of the error variance.
- c) Describe Split Plot Design. Give one application and its layout.

3. Attempt **any two** of the following : (5 each)

- a) Explain the concept of efficiency of a design. Derive an expression for efficiency of RBD over corresponding CRD.
- b) i) Give the mathematical model for LSD. State assumptions. Which principles of design of experiment are used in LSD ?  
ii) Explain Kruskal Wallis test for the analysis of non-normal data.
- c) Explain Yates procedure to obtain factorial effect totals in a  $2^3$  factorial experiment.



4. Attempt **any one** of the following :

- a) i) State the mathematical model in ANOCOVA in CRD. State the expressions for estimators of different parameters. **4**
- ii) Derive the expression for the main effect B in a  $2^3$  factorial experiment with factors A, B, C. Check whether this effect is orthogonal to the interaction effect BC. **6**
- b) i) What is the need of confounding in factorial designs ? Explain the concept of total confounding. **4**
- ii) Following data are available for a  $5 \times 5$  LSD : Row S.S. = 22, column S.S. = 26, Treatment S.S. = 16, Error S.S. = 18. Prepare ANOVA table. What is the unbiased estimate of the error variance for these data ? Test the hypothesis of equality of treatment effects. **6**

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- b) In each of the following cases, state whether the given statement is true or false : **(1 each)**
- i) A function by default returns an integer value.
  - ii) A function is called recursive if a statement within the body of a function calls the same function.

c) i) Explain the use of break statement with suitable example. **1**

ii) Write an expression in C for the following mathematical expression

$$\frac{x^3 - 4xy + 2y^2}{(x + y)^2} .$$

**1**

iii) What is the use of strlen ( ) ? **1**

iv) A C program contains the following variable declarations : **1**

int i = 1627;

float y = 16.273;

What will be the output for the following statement ?

Print f (“% 7 d \ n % 7.2 f \ n”, i, y);

2. Attempt **any two** of the following : **(5 each)**

a) Explain each of the following giving their syntax and usage with an example.

i) scanf ( )

ii) printf ( )

iii) getchar ( )

b) Draw a flowchart to get and print factorial value of a positive integer.

c) What is a user defined function in C ? Write a function to find greatest common divisor (gcd) of two given numbers.



3. Attempt **any two** of the following : **(5 each)**

- a) Write a C program to compute and print mean and standard deviation of 10 numbers entered through keyboard.
- b) A shop has announced the following seasonal discounts on purchase amount.

<b>Purchase Amount (PA) (in Rs.)</b>	<b>Discount (%)</b>
$0 \leq PA \leq 999$	8
$1000 \leq PA \leq 1999$	10
$2000 \leq PA \leq 2999$	12
$PA \geq 3000$	15

Write a C program that will accept the purchase amount (PA) and compute net bill to be paid after the discount and print purchase amount, discount, net bill on separate lines.

- c) Explain the concept of a pointer with a suitable illustration. Give syntax and example for declaring and initializing a pointer. Explain how to access contents of a variable through pointer.

4. Attempt **any one** of the following :

- a) i) What is an array ? How is a two -dimensional array declared and initialized ?  
Give an illustration. **4**
- ii) Write a C program to find maximum of 10 given numbers. **6**
- b) i) What is a structure ? How are structures declared ? Give one example. **3**
- ii) Write a C program that will read a string through keyboard and print it in alphabetical order. **7**

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**STATISTICS (Principal) (Paper – VI)**  
**ST 336 (A) : Operations Management**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Use of scientific calculators and statistical tables is **allowed**.*  
4) *Symbols and abbreviations have their **usual meanings**.*

1. Attempt **each** of the following : **(1 each)**

a) In each of the following cases choose the correct alternative from the given alternatives.

i) A critical path in the network is

- A) the shortest path
- B) the longest path
- C) the path with maximum number of activities
- D) the path with minimum number of activities

ii) In Hurwicz criterion we choose the strategy that maximises

- A)  $\alpha$  (maximum pay off) +  $(1 - \alpha)$  (minimum pay off)
- B)  $\alpha$  (minimum pay off) +  $(1 - \alpha)$  (maximum pay off)
- C)  $\alpha$  (maximum pay off + minimum pay off)
- D)  $(1 - \alpha)$  (maximum pay off + minimum pay off)

Where  $\alpha$  = coefficient of optimism.

iii) In ABC analysis C type of items are those which have

- A) low unit price
- B) low usage value
- C) low consumption
- D) high consumption

**P.T.O.**



iv) The free float of an activity is equal to the difference between

- A) Latest start and earliest start times
- B) Latest completion and earliest completion times
- C) Latest start and latest completion times
- D) Earliest start and earliest completion times

b) In **each** of the following cases state whether the given statement is **true** or **false** : **(1 each)**

- i) In PERT most likely time is the mean of optimistic and pessimistic times.
- ii) The duration of an activity may be reduced below its crash time by allocating more resources than originally planned.

c) Define **each** of the following : **(1 each)**

- i) cost slope of an activity
- ii) total float.

d) i) What is maximax criterion ? **(1 each)**

- ii) State the formula for Economic order quantity in an inventory model with uniform rate of demand, finite replenishment with shortages.

2. Attempt **any two** of the following : **(5 each)**

a) Write a short note on VED analysis.

b) A project consists of following activities and time estimates.

Activity	$t_o$	$t_m$	$t_p$
1 – 2	1	1	7
1 – 3	1	4	7
1 – 4	2	2	8
2 – 5	1	1	1
3 – 5	2	5	14
4 – 6	2	5	8
5 – 6	3	6	15

i) Draw project network.

ii) Find the expected time and variance for each activity.



c) A vehicle costs Rs. 50,000/- running costs and resale values every year are given below :

Year	Running cost	Resale value
1	5000	30000
2	6000	15000
3	7000	7500
4	9000	3750
5	12500	2000
6	16000	2000
7	18000	2000

Determine optimal replacement time.

3. Attempt **any two** of the following : **(5 each)**

- a) Derive an expression for economic lot size with uniform rate of demand, instantaneous replenishment and no shortages.
- b) The following data relate to a network

Activity	Duration (Days)
1 – 2	5
1 – 3	14
2 – 3	9
2 – 4	15
2 – 5	8
3 – 5	9
4 – 5	4
5 – 6	5

Calculate earliest and latest event times and hence determine the critical path. Also find the project duration.



- c) A businessman buys an item at Rs. 8/- and sells it at Rs. 12/-. The following table gives the sales for last 100 days.

<b>No. of items sold</b>	25	26	27	28	29
<b>No. of days</b>	10	10	25	40	15

Determine using EMV criterion, how many items he has to purchase in order to maximise his profit.

4. Attempt **any one** of the following :

- a) i) What are the situations which make the replacement of items necessary ? **3**

- ii) The following table gives data related to network.

<b>Activity :</b>	<b>1 – 2</b>	<b>1 – 3</b>	<b>2 – 4</b>	<b>3 – 4</b>
<b>Normal time (weeks) :</b>	6	4	8	6
<b>Normal cost (Rs.) :</b>	7000	6000	5000	9000
<b>Crash time (weeks) :</b>	4	2	6	4
<b>Crash cost (Rs.) :</b>	11000	9000	7000	14000

Determine critical path and find normal project duration. Crash the relevant activities and determine optimal project duration, if indirect cost is Rs. 500/- per week. **7**

- b) i) A factory requires 3600 kg of raw material for producing an item per year. The cost of placing an order is Rs. 36/- and the holding cost of the stock is Rs. 2.50/- per kg per year. Determine Economic order quantity. **5**

- ii) For the following pay-off matrix

<b>Events</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>Strategy</b>			
<b>S<sub>1</sub></b>	700	300	160
<b>S<sub>2</sub></b>	500	450	200
<b>S<sub>3</sub></b>	300	300	100

Determine optimal strategy using

- i) Maximin                      ii) Laplace criterion. **5**

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**STATISTICS (Principal)**  
**ST 336 (B) : Actuarial Statistics (Paper – VI)**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- 1) *All questions are compulsory.*
  - 2) *Figures to **right** indicate **full** marks.*
  - 3) *Use of scientific calculator and statistical table is **allowed**.*
  - 4) *Symbols and abbreviations have their **usual meanings**.*

1. a) Attempt **each** of the following :

In each of the following cases choose the correct alternative. **(1 each)**

i) The distribution function of T (x) denoted by  $G_x(u)$  is given by

A)  $\frac{s(x + u) - s(x)}{s(x)}$

B)  $\frac{s(x) - s(x + u)}{s(x)}$

C)  $\frac{s(x) - s(x + u)}{s(x + u)}$

D)  $\frac{s(x)}{s(x + u)}$

ii) Range of possible values of curtate future life time of (x) is

A)  $x, x+1, \dots$

B)  $(0, \infty)$

C)  $(-\infty, \infty)$

D)  $0, 1, 2, \dots$



iii) If force of mortality  $\mu$  and force of interest  $\delta$  are constant then  $\bar{A}_x$

A)  $\mu$

B)  $\delta$

C)  $\frac{\mu}{\mu + \delta}$

D)  $\frac{1}{\mu + \delta}$

iv) If  $y = \bar{a}_{\overline{T}|}$  then distribution function of Y is

A)  $P[T \leq \log(1 - \delta)]$

B)  $P\left[T \leq -\frac{\log(1 - \delta y)}{\delta}\right]$

C)  $P[T \leq -\log(1 - \delta y)]$

D)  $P[T \leq \log(1 - \delta y)]$

b) In **each** of the following cases state whether the given statement is **true** or **false** : (1 each)

i) Force of interest  $\delta$  and discount factor  $V$  are related by  $V = e^{-\delta}$ .

ii) For feasibility of insurance business its utility function must be non-decreasing and concave.

c) Explain **each** of the following terms : (1 each)

i) Benefit

ii) Loss at issue random variable.

d) Give meaning of the following notation (1 each)

i)  $e_x^o$

ii)  $\bar{P}(\bar{A}_x)$ .





2. Attempt **any two** of the following : **(5 each)**

- a) i) Explain the responsibilities of an actuary in an insurance company.  
ii) State any two uses of a life table.
- b) Under the assumption of uniform distribution of deaths in unit interval of time  
 $l_{56} = 9862, l_{55} = 9910, l_{54} = 10100$   
find :
  - i)  ${}_{1.5}P_{54}$
  - ii)  $\mu_{55.5}$
- c) With effective rate of interest 6% per annum find :
  - i) Nominal rate of interest convertible quarterly.
  - ii) Effective rate of discount.
  - iii) Accumulated value of Rs. 25,000 at the end of 4<sup>th</sup> year.
  - iv) Present value of Rs. 10,000 due after the end of 5<sup>th</sup> year.
  - v) Force of interest.

3. Attempt **any two** of the following : **(5 each)**

a) Survival rates ( $p_x$ ) for a certain population of insects are as follows :

Age in years (x)	0	1	2	3	4	5	6
$p_x$	0.9	0.8	0.7	0.5	0.4	0.2	0.0

Construct the columns  $l_x, L_x$  and  $T_x$  for a radix of 20,000. Also find the probability that an insect from this radix will survive atleast 2 years.

b) With usual notation show that

$${}_{t/\mu}q_x = (\mu^q_{x+t})(t^p_x).$$

- c) Obtain E (z) where z is net single premium in terms of V for
  - i) n year term insurance
  - ii) whole life insurance
  - iii) n year pure endowment insurance.



4. Attempt **any one** of the following :

- a) I) For a fully continuous whole life insurance 1 on (x), suppose  $\mu_x(t) = 0.04$ ;  $t \geq 0$  and  $\bar{A}_x = 0.4$ . If premiums are determined by equivalence principle, calculate the variance of loss random variable L. **5**

II) With usual notations show that

$$\bar{a}_{n|} = \frac{1 - v^n}{\delta} \quad \mathbf{5}$$

- b) I) Explain the concept of utility function with two illustrations. **5**

II) The p.d.f. of future life time T for (x) is given by

$$g(t) = \frac{1}{80}; \quad 0 \leq t \leq 80$$

$$= 0; \quad \text{otherwise}$$

Find the net single premium for whole life insurance of a unit amount issued to (x) at force of interest ( $\delta$ ) 0.05. **5**

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**STATISTICS (Principal)(Paper – VI)**  
**ST 336 (C) : Time Series Analysis**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) All questions are compulsory.  
2) Figures to the **right** indicate **full** marks.  
3) Use of scientific calculator and statistical tables is **allowed**.  
4) Symbols and abbreviations have their **usual meanings**.

1. a) Attempt **each** of the following.

Choose the correct alternative, in each of the following : **(1 each)**

i) Under multiplicative model, trend T is eliminated from time series  $y_t$  by considering

- A)  $y_t - T$       B)  $y_t + T$       C)  $\frac{y_t}{T}$       D)  $y_t \cdot T$

ii) In double exponential smoothing, the relationship used for estimation of trend is

- A)  $\hat{y}_t = (1 - \alpha)\hat{y}_{t-1} + \alpha y_{t-1}$   
B)  $\hat{y}_t = (1 - \alpha)\hat{y}_{t-1} + \alpha y_t$   
C)  $\hat{y}_t = (1 - \alpha)^2 \hat{y}_{t-1} + [1 - (1 - \alpha)^2] y_t$   
D)  $\hat{y}_t = (1 - \alpha)^2 \hat{y}_{t-1} + [1 - (1 - \alpha)^2] y_{t-1}$

iii) Box-Cox transformation is given by

- A)  $\frac{y^\lambda - 1}{\lambda}, \lambda \neq 1$       B)  $\sqrt{y}$       C)  $\log y$       D)  $\frac{1}{y}$

iv) For a series of 20 observations  $\sigma_e^2 = 50$ . Under AR (2) model, residual sum of squares (res s.s) is

- A) 100      B) 900      C) 950      D) 2.5



- b) State whether **each** of the following statement is **true** or **false** : (1 each)
- i) Differencing is used to reduce non-stationary time series to stationary series.
  - ii) Method of selected points uses middle most observations.
- c) Define :
- i) Time series : Give one illustration. 1
  - ii) First and second order differences. 1
- d) i) State additive model of time series. 1
- ii) State AR (1) model. 1

2. Attempt **any two** of the following : (5 each)

- a) Define moving average of length K. Explain the role of moving averages in analysis of time series.
- b) Write a note on Box-Jenkin technique.
- c) Obtain trend estimates using simple exponential smoothing method, with  $\alpha = 0.2$ , for the following series :

Year	2004	2005	2006	2007	2008	2009
Sale (in lacs Rs.)	20.6	16.4	38.3	31.4	28.2	19.4

Obtain trend estimate for year 2010.

Plot a graph for observed and estimated values on some graph.

3. Attempt **any two** of the following : (5 each)

- a) Explain different methods for measurement of seasonality in time series and deseasonalization of time series under multiplicative model.
- b) Write a note on use of non-parametric tests in analysis of time series.
- c) Given  $n = 16$ ,  $\sum t = 136$ ,  $\sum t^2 = 1496$ ,  $\sum t.y_t = 846.021$ ,  $\sum y_t = 95.256$ ,  $\sum y_t^2 = 571.02$ , fit a linear trend by method of least squares. Interpret the results obtained. Obtain  $\hat{y}_{17}$ .



4. Attempt **any one** of the following :

a) i) Define auto correlation function. State its use. **4**

ii) Calculate Durbin-Watson test statistic, from the information given below : **6**

$y_t$	<b>9.7</b>	<b>10.5</b>	<b>12.5</b>	<b>11.7</b>	<b>11.6</b>	<b>8.5</b>	<b>10.0</b>	<b>7.4</b>	<b>7.8</b>	<b>8.6</b>
$\hat{y}_t$	10.38	10.83	10.71	10.75	10.65	9.5	9.8	9.4	9.3	10.2

b) i) Explain, in detail, use of plots in study of time series. **4**

ii) Define sample auto correlation coefficient of lag 1 ( $r_1$ ) . Carry out 'Rule of thumb' procedure if  $r_1 = -0.523$  for a sample of size 25. **6**





[3817] – 350

**T.Y. B. Sc. (Semester – III) Examination, 2010  
GEOGRAPHY**

**Gg : 331- Principles and Techniques of Watershed Management  
Paper – I (2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate full marks.*  
3) *Draw neat diagrams and maps **wherever** necessary.*  
4) *Use of map-stencils is **allowed**.*

1. Answer the following questions in **one/two** sentences.

**10**

- a) What is water shed?
- b) Define Run-off.
- c) What is intercaption ?
- d) List any two objectives of Watershed Management.
- e) What is a water table ?
- f) Explain baseflow.
- g) Unsaturated zone – Explain.
- h) Land capability – Define.
- i) What is soil water ?
- j) Define evapotranspiration.

**P.T.O.**



2. Write short answers (**any two**) : **10**

- a) Discuss the need of Watershed Management.
- b) Discuss the watershed areas as delineated by All India Soil and Land Use Survey.
- c) Discuss the major hindrances in Watershed Development Programme.

3. Write short notes (**any two**) : **10**

- a) Hydrological cycle.
- b) Size and shape of watershed areas.
- c) Climate factors and watershed areas.

4. Discuss the major principles of watershed management. **10**

OR

Discuss the criteria for selection of watershed.

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[3817] – 351

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**GEOGRAPHY**

**Gg-332 : Geography of Travel and Tourism**  
**(Paper – II) (2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- i) All questions are compulsory.*
  - ii) Figures to the **right** indicate full marks.*
  - iii) Diagrams and maps must be drawn **wherever** necessary.*
  - iv) Use of map-stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences. **10**
- a) State any two dynamic elements of tourism.
  - b) What is a summer resort ?
  - c) What is meant by absolute location ?
  - d) Mention any two natural features as tourist attractions from Maharashtra.
  - e) Define the concept of intervening opportunity.
  - f) State any two impacts of topography on tourism.
  - g) Who is an international tourist ?
  - h) State the most common purpose of travel in India.
  - i) Mention any two socio-economic characteristics of tourism.
  - j) What is national culture ?

**P.T.O.**



2. Write short answers (**any two**) : **10**
- a) Describe spatial patterns of demand
  - b) Discuss accessibility as physical asset.
  - c) Differentiate travel from tourism.
3. Write notes on (**any two**) : **10**
- a) Levels of tourist satisfaction.
  - b) Man-made objects as tourist attractions.
  - c) Lakes and tourism.
4. Explain the importance of tourism as a regional resource. Substantiate your answer with suitable examples. **10**

OR

Describe with suitable examples the impact of culture on tourism.

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[3817] – 352

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**GEOGRAPHY (Paper – III)**  
**Gg-333 : Fundamentals of Geoinformatics (Paper – I)**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- 1) *All questions are compulsory.*
  - 2) *Figures to the right indicate full marks.*
  - 3) *Diagrams and maps must be drawn wherever necessary.*
  - 4) *Use of map stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences.

**10**

- a) Mention any two components of GIS.
- b) What is attribute data ?
- c) What is DBMS (Data Base Management System ) ?
- d) Define DTM.
- e) What is entity ?
- f) What is satellite image ?
- g) Mention any two functions of GIS.
- h) What is raster data ?
- i) Mention any two commercial data sources of GIS ?
- j) Write any two characteristics of raster data.

**P.T.O.**



2. Write short answers (**any two**) : **10**

- a) Write a note on “Modelling surfaces”.
- b) Explain how toposheets are data sources in GIS ?
- c) Write in brief history of GIS.

3. Write short notes (**any two**) : **10**

- a) Measuring lengths and areas.
- b) GPS as a data source in GIS.
- c) DEM.

4. Give comparative account of Raster and Vector data models in GIS.

OR

Explain how remote sensing and GIS are helpful in urban studies. **10**

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[3817] – 353

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**GEOGRAPHY (Paper – IV)**  
**Gg-334 : India : A Geographical Analysis (New Course)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- i) All questions are compulsory.*
  - ii) Figures to the **right** indicate **full** marks.*
  - iii) Draw neat diagrams and sketches **wherever** necessary.*
  - iv) Use of map stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences.

**10**

- a) Describe the geographical location of India within Asia.
- b) State any two major geological formations from southern India.
- c) What is the sequence of the Himalayan ranges from north to south ?
- d) Name the state having the longest coastline in India.
- e) State any two conditions suitable for the formation of lateritic soil.
- f) State any two regions of India, where sheet erosion is common.
- g) Which state in central India has over 30 percent forest cover ?
- h) State any two characteristic features of ever-green forest.
- i) What is meant by mountain climate ?
- j) Name any two districts from the drought-prone area of Maharashtra.

**P.T.O.**



2. Write short answers (**any two**) : **10**

- a) Describe the space relationship of India with neighboring countries.
- b) Comment on the physiography of coastal low lands.
- c) State major soil types of peninsular India.

3. Write short notes (**any two**) : **10**

- a) Monsoon weather
- b) Red Soils of India
- c) Forest conservation in India.

4. Explain the drainage system of India with reference to east flowing rivers.

OR

Divide India into climatic regions and explain any one of them in detail. **10**

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[3817] – 354

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**GEOGRAPHY**  
**Gg : 335 : Geography of Soils (Paper – V)**  
**2008 Pattern (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- 1) *All questions are compulsory.*
  - 2) *Figures to the **right** indicate full marks.*
  - 3) *Draw Neat diagrams and maps **wherever** necessary.*
  - 4) *Use of map-stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences.

**10**

- a) Define Soil moisture.
- b) What is meant by Soil texture ?
- c) Define Biological weathering.
- d) What is Soil porosity ?
- e) Define water holding capacity.
- f) What is Pedology ?
- g) What is Soil pH ?
- h) What is meant by leaching ?
- i) What is the importance of Soil studies ?
- j) What are primary minerals ?

**P.T.O.**



2. Write short answers (**any two**) : **10**
- a) Describe the process of Nitrogen fixation.
  - b) Distinguish between weathering and erosion.
  - c) What is soil catena ?
3. Write short notes (**any two**) : **10**
- a) Soil porosity and density.
  - b) Soil colour
  - c) Classification of tropical Soils.
4. Draw a neat labelled diagram of the soil profile and elaborate the zones of eluviation and illuviation. **10**

OR

Classify world Soils and discuss zonal, azonal and intrazonal soils.

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[3817] – 355

**T.Y. B. Sc. (Semester – III) Examination, 2010**  
**GEOGRAPHY (Paper – VI)**  
**Gg-336 : Fundamentals of Geoinformatics Paper – II (New)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- 1) *All questions are compulsory.*
  - 2) *Figures to the right indicate full marks.*
  - 3) *Diagrams and maps must be drawn wherever necessary.*
  - 4) *Use of map-stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences. **10**
- a) Distinguish between emission and transmission.
  - b) What do you understand by IR scanners ?
  - c) Mention any two types of aerial cameras.
  - d) What is panchromatic photograph ?
  - e) Mention various types of scattering.
  - f) Mention types of stereoscopes.
  - g) State the relation between wave length and frequency.
  - h) What do you understand by principal point ?
  - i) What is overlap ?
  - j) What is Pseudoscopic image ?

**P.T.O.**



2. Write short answers (**any two**) : **10**

- a) What is annotation strip on an aerial photograph ?
- b) Distinguish between principle point and conjugate principle point.
- c) What are fudicial marks on an aerial photograph ?

3. Write short notes (**any two**) : **10**

- a) Electromagnetic radiation
- b) An aerial photograph as a central perspective projection.
- c) Pseudoscopic image.

4. Give an account of ‘electromagnetic spectrum’. **10**

OR

Write an explanatory note on applications of remote sensing.

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[3817] – 357

**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**(New Course) (2008 Pattern)**  
**MICROBIOLOGY (Paper – II)**  
**MB 332 : Genetics and Molecular Biology – I**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labelled diagrams wherever necessary.*

1. Answer the following :

10

A) Match the following :

**A**

- i) Photolyase
- ii) Lytic cycle of  $\lambda$
- iii) PD, NPD & T
- iv) Bacterial promoter
- v) Tryptophan operon

**B**

- a) Cro protein
- b) Types of tetrad
- c) Consensus sequences
- d) Dual control
- e) Repair of thymine dimers.

B) Choose the correct answer :

a) Replication of DNA in E-Coli begins at

- i) ori A
- ii) ori B
- iii) ori C
- iv) ori R

b) Mismatch repair of bacterial chromosome requires

- i) U.V. light
- ii) Mut gene products
- iii) Photolyase
- iv) Normal copy of the defective gene

c) The chain terminating codon in protein synthesis in bacteria is

- i) UGC
- ii) AUG
- iii) UAG
- iv) UUU

P.T.O.



d) HMC is found in the DNA of \_\_\_\_\_ phage.

i) T<sub>3</sub>

ii) T<sub>4</sub>

iii) T<sub>5</sub>

iv) T<sub>7</sub>

e) Ara BAD region of DNA does not code for

i) Epimerase

ii) Isomerase

iii) Kinase

iv) Permease

2. Draw diagrams of **any two** of the following : **10**

a) Autogenous circuit for CI protein in maintenance of  $\lambda$  lysogeny.

b) Rho dependent termination of transcription.

c) Schematic representation of excision repair.

3. Answer **any two** of the following : **10**

a) Explain attenuation control in tryptophan operon.

b) Comment on conditional lethal mutants of T<sub>4</sub>.

c) Explain the concept of polyploidy with suitable example.

4. Answer **any one** of the following : **10**

a) Diagrammatically explain Initiation of translation in protein synthesis in prokaryotes.

b) Diagrammatically represent heterokaryon formation. Explain the mechanism of mitotic crossing-over and give its significance in parasexual cycle of Asp. nidulans.

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[3817] – 364

**T.Y. B.Sc. (Sem. – III) Examination, 2010**  
**ELECTRONIC SCIENCE (Paper – III)**  
**EL-333 : Analog System Design and Applications of Linear IC's**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :* 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Neat diagrams must be drawn wherever necessary.*

1. Attempt **all** of the following:

- |  |   |
|--|---|
| a) What are the requirements of safety grounding ?   | 1 |
| b) State applications of Integrator.   | 1 |
| c) State the elements contributing to successful design of electronic system.                  | 1 |
| d) Give the applications of VCO.   | 1 |
| e) The 741 OP Amp is connected as inverting amplifier with gain of 20. What is the Bandwidth ? | 2 |
| f) "Reference voltage is needed for voltage regulators." Comment.                              | 2 |
| g) Give one disadvantage and one advantage of active filter over passive filter.               | 2 |
| h) State applications of clipper and clamper.  | 2 |

2. Answer **any two** of the following :

- |   |   |
|---|---|
| a) List the selection criteria used to select operational amplifier for a particular application. Explain in brief. | 4 |
| b) Draw the circuit of peak detector using two OP Amps. What is function of each OP Amp used ?                      | 4 |
| c) Draw circuit diagram of ON-OFF controller using comparators. Explain its working.                                | 4 |

P.T.O.



3. Answer **any two** of the following :

- a) Draw circuit diagram of quadrature oscillator. Explain its working. **4**
- b) Using block diagram, explain how log and antilog amplifiers can be used as multiplier and divider. **4**
- c) What are the advantages of precision rectifier over ordinary diode rectifier ? Explain the working of ac to dc converter using block diagram. **4**

4. Answer the following :

- a) Explain the working of practical differentiator using OP Amp. How it can be stabilized ? **6**
- b) Explain the concept behind switched capacitor filter. State the limitation of switch capacitor filter. **6**

OR

4. Answer the following :

- a) For VCO using 566, calculate the change in output frequency if  $V_C$  is varied between 9.5 V to 11.0 V.  
Given  $V = +12V$ ,  $R_2 = 15\ \Omega$ ,  $R_3 = 100\ k\Omega$ ,  
 $R_1 = 6.8\ k\Omega$ ,  $C_1 = 75\ pF$ . **4**
- b) Design a voltage regulator using IC 723 for 5V and 1.5 Amp. **4**
- c) Design second order low pass filter at high cut off frequency of 50 KHz and pass band gain 1.586. **4**

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[3817] – 367

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**Electronic Science (Paper – VI)**  
**EI 336-A Fiber Optics and Fiber Optic Communication (New)**

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*  
2) *Figures to right indicate full marks.*  
3) *Draw labelled diagram wherever necessary.*

1. Attempt **all** of the following :

- a) Define band rate and channel capacity of fiber optic communication system. **1**
- b) What is need of fiber optics in telephony ? **1**
- c) What is CATV ? **1**
- d) List different types of data links ? **1**
- e) What is total internal reflection in optical fiber ? **2**
- f) What is optical detector ? Give the requirements of optical detectors. **2**
- g) “In fiber optic communication system repeaters are used”, comment. **2**
- h) List the type of losses in optical fiber. Define bending radius. **2**

2. Attempt **any two** of the following :

- a) Draw the block diagram of fiber optic communication system. Explain each block in brief. **4**
- b) What is multimode graded index fiber ? Explain its parabolic index profile. **4**
- c) What is LASER ? Explain the principle of operation of semiconductor injection laser. **4**



3. Attempt **any two** of the following :

- a) Explain vapour phase deposition technique for preparation of low loss optical fiber with proper block diagram. **4**
- b) Write a short note on fiber optical video link. **4**
- c) Explain with proper block diagram the mechanism of coupling optical power from source to fiber and from fiber to detector. **4**

4. Attempt **any two** of the following :

- a) Describe the : refractive index profile and ray transmission in multimode step index fiber and single mode step index fiber. **6**
  - b) What is attenuation in optical fiber ? Write short note on material absorption losses in silica glass fiber. **6**
  - c) What is repeater ? Explain with block diagram its use in long haul high capacity digital system. **6**
-





**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**ELECTRONIC SCIENCE (Paper – VI B)**  
**El 336(B) : Sensors and Actuators (New)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Neat diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*  
4) *Log table / calculator is allowed.*

1. Attempt **all** of the following :

- a) Why the sensors are needed ? 1
- b) What is thermistor ? 1
- c) Define Actuators. 1
- d) Sensors are very useful in automobiles comment. 2
- e) Why signal conditioning is used in instrumentation systems ? 2
- f) List different methods used for deposition of thin film sensors. 1
- g) What do you mean by electro-optical device ? Give any two examples. 2
- h) Write specifications of electromagnetic relay. 2

2. Attempt **any two** of the following :

- a) What are the transduction principles used in sensors ? Explain any one with suitable example. 4
- b) Explain construction and working principle of photovoltaic cell. 4
- c) Describe in brief the principle of working of junction semiconductor type sensor. 4



3. Attempt **any two** of the following :

- a) What is thermocouple ? Explain construction of M.I. thermocouple with proper diagram. **4**
- b) Explain eddy current sensor with suitable diagram. **4**
- c) Describe construction and working principle of LED. **4**

4. Attempt **any two** of the following :

- a) Explain the design considerations of instrumentation amplifier with suitable circuit diagram. **6**
- b) What are the steps involved in thin film technology ? Explain. **6**
- c) State what type of sensors are used in computer applications ? Explain any one of them. **6**

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[3817] – 368

**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – I)**  
**DS-331 : Science, Technology and National Security**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B. : i) All questions are compulsory.*  
*ii) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences each : **16**
  - 1) Define 'Science'.
  - 2) Define 'Technology'.
  - 3) Define 'National Security'.
  - 4) What is AWACS ?
  - 5) Define 'Aerospace Defence'.
  - 6) What is Electronics Security ?
  - 7) Define RADAR.
  - 8) What do you mean by High Energy Physics ?
  
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Establish relationship between science and society.
  - 2) How science and technology was evolved ?
  - 3) Explain the significance of information warfare.
  
3. Write short notes on (**any two**) : **8**
  - 1) Development Trends in Defence Material.
  - 2) Revolution in Military Affairs.
  - 3) Industrial Revolution.
  
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Explain the Military application of Electronic Technology.
  - 2) Explain the Military application of space borne assets.



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE & STRATEGIC STUDIES (Paper – III)**  
**DS-333 : Study of Disaster (New) (2008 Pattern)**

Time : 2 Hours

Max. Marks: 40

*N.B. : i) All the questions are **compulsory**.  
ii) Figures to the **right** indicate **full** marks.*

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) Write full form of NDMA.
  - 2) State any two functions of NDMA.
  - 3) Define disaster management.
  - 4) What do you mean by ‘Tsunami’ ?
  - 5) Explain the meaning of man-made disaster.
  - 6) Write any two importance of training in ‘disaster management’.
  - 7) State importance of communication in disaster.
  - 8) Define Global warming.
2. Answer in **8 to 10** sentences **each (any two)** : **8**
  - 1) Explain aims of study of disaster.
  - 2) Discuss types of disaster.
  - 3) Explain effects of disaster.
3. Write short notes on **(any two)** : **8**
  - 1) Pollution
  - 2) Coastal area
  - 3) Environment and population.
4. Write in **16 to 20** sentences **(any one)** : **8**
  - 1) Write a note on Nuclear war and disaster.
  - 2) Explain traditional war and disaster.



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**Defence and Strategic Studies (Paper – IV)**  
**DS-334 : RESEARCH METHODOLOGY**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B. : i) All questions are compulsory.*  
*ii) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences each : **16**
  - 1) What is Social Sciences ?
  - 2) What is Natural and Physical Sciences ?
  - 3) What is Research ?
  - 4) Why Research is Conducted ?
  - 5) What is conceptualisation ?
  - 6) Define 'Statistics'.
  - 7) What is meant by 'Problem' ?
  - 8) What is meant by 'Methodology' ?
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Write the role of research in important areas.
  - 2) Explain the characteristics of research.
  - 3) Which questions must be answered by research design ?
3. Write short notes on (**any two**) : **8**
  - 1) Hypothesis.
  - 2) Research Report.
  - 3) Data Collection.
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Explain about the possible field of research in the subject – Defence and Strategic Studies.
  - 2) Explain the sources of stating a problem.



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – V)**  
**DS-335 : Computer Application in Defence Management (New)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

1. Answer in **2 to 4** sentences **each** : **16**
    - 1) Define Assembly Language.
    - 2) State the meaning of Artificial intelligence.
    - 3) Define Algorithm.
    - 4) What do you mean by Buffer ?
    - 5) Explain the meaning of CAI.
    - 6) State the meaning of Fifth generation computers.
    - 7) Define Flow chart.
    - 8) What do you mean by Hybrid computer ?
  
  2. Answer in **8 to 10** sentences (**any two**) : **8**
    - 1) Explain operations system of a computer.
    - 2) Discuss generations of computers.
    - 3) Explain pay roll system of computer.
  
  3. Write short notes on (**any two**) : **8**
    - 1) C4
    - 2) CAD
    - 3) CAM
  
  4. Answer in **16 to 20** sentences (**any one**) : **8**
    - 1) Explain application of computer in weather forecasting.
    - 2) Write a note on applications of computer in Defence Management.
-



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VI)**  
**DS-336 (A) : Indian Military System – I (New) (2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

*N.B. : 1) All the questions are compulsory.*  
*2) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
- 1) What do you mean by Military History ?
  - 2) State any two necessity of study military History.
  - 3) Define strategy.
  - 4) What do you mean by the word 'Aryan' ?
  - 5) State any two characteristics of war during Ramayana Period.
  - 6) Write any two characteristics of Gupta Empire.
  - 7) State any two merits of Rajput.
  - 8) Write any two ideas of Kautilya of war.
2. Answer in **8 to 10** sentences (**any two**) : **8**
- 1) Explain sources of History.
  - 2) Discuss Art of warfare during Ramayana Period.
  - 3) Write a note on military system of vedic age.
3. Write short notes on (**any two**) : **8**
- 1) Rise of Rajput power.
  - 2) Kautilya's view on security affairs.
  - 3) Significance of Battle of Jhelum.
4. Write in **16 to 20** sentences (**any one**) : **8**
- 1) Write a note on "Kautilya's Arthashastra".
  - 2) Discuss military system of Rajput period.

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P.T.O.



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VI)**  
**DS-336 (B) : Maratha Military System – I (New)**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

*N.B. : 1) All the questions are **compulsory**.  
2) Figures to the **right** indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
    - 1) Write any two characteristics of Shivaji as a military leader.
    - 2) Who wrote book entitled, “History of Maratha Navy” ?
    - 3) Who wrote the book entitled, “War History of Marathas” ?
    - 4) Define Guerrilla war.
    - 5) State any two importance of ‘fort’ in warfare.
    - 6) Write any two features of Maharashtra region before Shivaji began his real career.
    - 7) In which year Mughal invaded Bijapur ?
    - 8) From which States, Shivaji’s system of administration was borrowed ?
  2. Answer in **8 to 10** sentences (**any two**) : **8**
    - 1) Explain aims of Karnataka Campaign.
    - 2) Discuss Shivaji, conflict with Shahiste Khan.
    - 3) Write a note on Battle of Pratapgad.
  3. Write short notes on (**any two**) : **8**
    - 1) Rise of Maratha power.
    - 2) Shivaji’s conflict with Adilshahi.
    - 3) Military system of Shivaji
  4. Answer in **16 to 20** sentences (**any one**) : **8**
    - 1) Explain Geographical condition of Maharashtra before Shivaji.
    - 2) Discuss ‘History of Maratha Navy’.
-





**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VI)**  
**DS-336 (C) : Indian Wars since Independence – I (New)**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks: 40

*N.B. : 1) All the questions are compulsory.*  
*2) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) Define war.
  - 2) State any two causes of Indo-Pak war of 1971.
  - 3) Write any two impact of India-China war of 1962.
  - 4) Write any two causes of India-Pak war of 1948.
  - 5) State the meaning of political settlement.
  - 6) Write the meaning of ceasefire.
  - 7) What do you mean by ‘Pakistan occupied Kashmir’ (POK)
  - 8) Write any two impact of India-Pak war of 1947-48.
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Explain background of 1947-48 war.
  - 2) Discuss affected sectors of 1947-48 war of India-Pakistan.
  - 3) Explain causes of 1962 war between India and China.
3. Write short notes on (**any two**) : **8**
  - 1) Political Negotiations.
  - 2) Domestic impact of Indo-Pak war of 1965.
  - 3) Domestic impact of India-China war of 1962.
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Explain regional impact of India-Pak war of 1965.
  - 2) Discuss global impact of India-China war of 1962.



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VII)**  
**DS – 337 (A) : Military Sociology (Optional)**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B. : i) All questions are compulsory.*  
*ii) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences each : **16**
  - 1) Define 'Military'.
  - 2) Define 'Sociology'.
  - 3) Define 'Demography'.
  - 4) Define 'War'.
  - 5) What is meant by Soldiering ?
  - 6) What do you mean by "Martial Race" ?
  - 7) What is Group Dynamics ?
  - 8) Define the term 'Warrior'.
  
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Explain social view of war and soldiering in India.
  - 2) Explain the role of Armed Forces in promoting national integration.
  - 3) Why Indian Infantry is organised on one class or fixed class composition ?  
Justify.
  
3. Write short notes on (**any two**) : **8**
  - 1) Military as a Modernised Group.
  - 2) Military Group – A sociological phenomenon.
  - 3) Discipline in the armed forces.
  
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Explain the reasons for declining popularity of Military profession.
  - 2) Make a MOSKOS Analysis of Military professional.

P.T.O.



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VII)**  
**DS – 337 (B) : Defence Journalism (Optional)**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B. : i) All questions are compulsory.*  
*ii) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
    - 1) Define 'Defence'.
    - 2) Define 'Journalism'.
    - 3) Who in "Investigative Reporter" ?
    - 4) Where Army H.Q. is located ?
    - 5) Where Central Air Command is located ?
    - 6) Where NDA is located ?
    - 7) Write the role of NCC.
    - 8) Write the role of Civil Defence.
  2. Answer in **8 to 10** sentences (**any two**) : **8**
    - 1) Write the role of Press.
    - 2) What are the duties of Journalists ?
    - 3) With what essential informations, a defence Journalist should be equipped ?
  3. Write short notes on (**any two**) : **8**
    - 1) Nature and scope of Defence Journalism.
    - 2) Hurdles in Defence Journalism.
    - 3) Defence and Media.
  4. Answer in **16 to 20** sentences (**any one**) : **8**
    - 1) Explain about the ingredients in Defence Journalism.
    - 2) You have witnessed a Fire Power Demonstration by I.A.F. for three hours. Give the report to the Editor of your News Paper.
-



**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VII)**  
**DS – 337 (C) : Defence Preparedness of India – I (Optional)**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*N.B. : i) All questions are compulsory.*  
*ii) Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) Define 'Defence'.
  - 2) What is the length of India's land border ?
  - 3) What is the length of India's coast line ?
  - 4) Define war Potential.
  - 5) Define 'Science'.
  - 6) Define 'Technology'.
  - 7) Name any four DPSU.
  - 8) Name any four Ordnance Factories.
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Make a geopolitical evaluation of India's land border.
  - 2) Discuss the military capability of India.
  - 3) Write the contribution of HAL in the development of India's airpower.
3. Write short notes on (**any two**) : **8**
  - 1) Security issues between India and China.
  - 2) Security issues between India and Pakistan.
  - 3) Security issues between India and Bangladesh.
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Write an essay on 'Defence and Development'.
  - 2) "In today's fast changing strategic environment, India need to harness the intrinsic power potential of military diplomacy to the optimum". Give suggestion to support this statement.



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**T.Y. B.Sc. (Semester – III) (Environmental Science) Examination, 2010**  
**ENV-304 : ISSUES IN ENVIRONMENTAL SCIENCE**  
**(New) (2008 Pattern) (Paper – IV)**

Time: 2 Hours

Max. Marks: 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Draw neat and labelled diagrams whenever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines each : **10**
- a) Define rehabilitation.
  - b) What is ODS's ?
  - c) Name the person known as father of Green revolution in India.
  - d) What is pastoralism ?
  - e) Define convention.
  - f) Name any 2 GNG's.
  - g) Write about the role of National Environmental Advisory Board.
  - h) Mention the problems of energy crisis.
    - i) What is energy conservation ?
    - j) Mention the significance of copenhagen.
2. Attempt **any 2** of the following : : **10**
- a) Explain the relationship between gender and environment.
  - b) Elaborate on the impact of Global warming on health.
  - c) How green revolution is useful to resolve food crisis ?
3. Write short notes on **any 2** of the following : **10**
- a) Sources of CO<sub>2</sub> emission
  - b) LCA
  - c) Bio-resources.
4. Attempt **any one** of the following : **10**
- a) Explain carbon emissions, sequestration and credits.
  - b) Elaborate on the methods of access to environmental information.



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**INDUSTRIAL CHEMISTRY – V**  
**Industrial Methods of Chemical Analysis**  
**(Vocational Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- 1) *All questions are compulsory.*
  - 2) *Figures to the right indicate full marks.*
  - 3) *Neat diagrams must be drawn wherever necessary.*
  - 4) *Use of calculator/Logarithmic table is allowed.*
  - 5) *Assume suitable additional data if necessary.*

1. Answer precisely the following : **10**
- a) What is Bremsstrahlung ?
  - b) State the limitation of DME.
  - c) What is the wavelength range of X-rays ?
  - d) Define the term 'half-wave potential' in polarography.
  - e) Write Duane-Hunt equation and state the meaning of each term in it.
  - f) Why are AAS lines very narrow ?
  - g) Name three types of Neutron sources.
  - h) State the two forms of lead found in petrol.
  - i) Define a flame.
  - j) Define soft method of ionization as used in mass spectrometry.
2. A) Answer **any two** of the following : **6**
- a) Write Ilkovic equation and explain the terms involved in it.
  - b) Draw a neat labelled diagram of an X-ray fluorescence apparatus.
  - c) Write a note on fluoride ion electrode.

P.T.O.



B) Answer briefly **any two** of the following : **4**

- a) State the advantages of DME.
- b) Give the values of Neutron flux obtained from nuclear reactor, radioisotope and accelerator.
- c) State any four applications of mass spectrometry.

3. Answer **any two** of the following : **10**

- a) Write the differences between AAS and FES.
- b) Give an account of the magnetic analyzer used in mass spectrometry.
- c) Determine the capillary characteristics of a capillary at a potential of  $-0.6$  V with respect to calomel, if 100 drops of mercury weigh 490 mg and the time of formation of 10 drops is 45 sec.

4. A) Discuss the technique of hydrodynamic voltammetry. **6**

OR

A) Discuss the errors involved in the measurement of pH using a glass electrode. **6**

B) Answer **any one** of the following :

- a) Enlist the applications of an X-ray fluorescence method. **4**
- b) What is the time taken by a butyl cation to reach the detector in a one meter

long time of flight mass analyzer at 1 kV ? (tube length = 1m and  $\frac{m}{z} = 5.9 \times 10^{-7}$ ).



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**INDUSTRIAL MICROBIOLOGY (Paper – V)**  
**VOC-IND-MIC-335 : Pollution Control Technology**

Time: 2 Hours

Max. Marks: 40

- Instructions :**
- 1) *Neat diagrams must be drawn wherever necessary.*
  - 2) *Black figures to the right indicate full marks.*
  - 3) *All questions carry equal marks.*
  - 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
  - 5) *Assume suitable data, if necessary.*
  - 6) *All questions are compulsory.*

1. Answer as directed :

10

A) Define the following :

Bioremediation.

B) Choose the correct answer :

- i) BOD is a measure of \_\_\_\_\_ used by microorganisms for biological oxygen demand.
  - i) Volatile oxygen
  - ii) Dissolved carbon
  - iii) Volatile carbon
  - iv) Dissolved oxygen
- ii) Most commonly used coagulant in drinking water treatment plant is \_\_\_\_\_
  - i) Aluminium sulphate
  - ii) Ferrous sulphate
  - iii) Aluminium phosphate
  - iv) Copper sulphate
- iii) The depth of biofilter varies from \_\_\_\_\_
  - i) 0.9 to 2.5 m
  - ii) 0.1 to 0.8 m
  - iii) 2.9 to 5 m
  - iv) 3 to 4.9 m
- iv) Screens composed of parallel bars are usually termed as \_\_\_\_\_
  - i) Bar rocks
  - ii) Bar tubes
  - iii) Bar slides
  - iv) Bar screens

P.T.O.





- C) Give any two objectives of waste water treatment.
- D) State the purpose of flow equalization.
- E) State limitations of BOD analysis.
- F) Name the institution in Maharashtra that regulates pollution norms.
- G) What is aqua culture ?

2. Answer **any two** of the following : **10**

- a) What is the role of screens and grit chambers in waste water treatment process ?
- b) Justify the composition of waste water is diverse.
- c) Write short note on different types of solids present in waste water.

3. Answer **any two** of the following : **10**

- a) Describe the design of a imhoff tanks.
- b) Write short note on Trouble shooting in ETP.
- c) State and explain the need for Environment Impact Assessment.

4. Determine the size of high rate tricking filter for the following data : **10**

Flow = 4.5 M/d

Recirculation ratio = 1.5

BOD of raw waste = 230 mg/L

Final BOD desired for effluent = 30 mg/L

OR

Describe the design and working of oxidation lagoon.

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**T.Y. B.Sc. (Voc.) (Semester – III) Examination, 2010**  
**SEED TECHNOLOGY**  
**Paper V : Seed Pathology and Entomology**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*Instructions :1) All questions are compulsory.*

*2) Figures to the **right** indicate **full** marks.*

*3) Sketch neat labelled diagrams **wherever** required.*

I. Answer the following :

**(10×1=10)**

- a) Give one example of storage fungi.
- b) Give any one method of seed health testing.
- c) What is seed treatment ?
- d) Write one example of seed borne bacteria.
- e) Enlist any two entry points of seed infection.
- f) Define hexapoda.
- g) What is halter ?
- h) Give the examples of any two pests of pulses.
- i) What is the meaning of obtact pupa ?
- j) Give one example of pterygotes.

**P.T.O.**



II. Attempt **any two** of the following **(2×5=10)**

- a) Write an account on the influence of seed borne diseases on seeds.
- b) Describe in detail any one method used for seed health testing.
- c) Write any five general characters of order Diptera.

III. Write notes on **any two** of the following : **(2×5=10)**

- a) Management of seed storage structures.
- b) Complete metamorphosis.
- c) Pheromones.

IV. What is seed transmission ? Explain the mechanism of seed transmission. **10**

OR

What are storage grain pests ? Describe the life cycle, damage and control measures of rice weevil. **10**

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**INDUSTRIAL CHEMISTRY – VI**  
**(2008 Pattern)**  
**Inorganic and Organic Based Industries – I**  
**(Vocational Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- 1) *All questions are compulsory.*
  - 2) *Figures to the **right** indicate **full** marks.*
  - 3) *Neat diagrams must be drawn **wherever** necessary.*

1. Answer the following questions : **10**
  - a) What is vulcanisation ?
  - b) Name the catalyst used in Ostwald's process.
  - c) Define the term "Massecuite".
  - d) What is Phosphatic Fertilizers ?
  - e) What are paint removers ? Give examples.
  - f) What are repellants ?
  - g) Give steps in fermentation process.
  - h) Give names of nitrogenous fertilizers.
  - i) Give the structure of DDT.
  - j) What is proof spirit ?
  
2. A) Attempt **any two** of the following : **6**
  - a) Why is urea considered to be the best nitrogenous fertilizer ?
  - b) What are operations involved in fermentation ?
  - c) How is mustard gas prepared ?

**P.T.O.**



- B) Attempt **any two** of the following : **4**
- a) What are attracts and repellants ?
  - b) Give applications of bagasse.
  - c) What are the types of explosives ?

3. Attempt **any two** of the following : **10**
- a) Describe the manufacture of urea from ammonia with flow sheet diagram.
  - b) Explain enamel paints with its uses.
  - c) Write a note on Tri-nitro Toluene.

4. A) Describe the refining of sugar with flow sheet. **6**

OR

- A) Describe the manufacture of alcohol from molasses. **6**

- B) Attempt **any one** of the following : **4**

- a) Write a note on coffee still.
- b) What are herbicides ? Give examples and state its uses.



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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**BIOTECHNOLOGY (Vocational)**  
**Environmental Biotechnology (Voc. Biotech – 336)**  
**(Paper – VI) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw diagrams wherever necessary.*

1. Answer each of the following : **10**
- a) What is environmental biotechnology ?
  - b) Define biostimulation.
  - c) What is biosorption ?
  - d) Define bioremediation.
  - e) Comment on hazardous waste in two lines.
  - f) Give any two raw materials for biogas production.
  - g) What are bio-fuels ?
  - h) Define biofertilisers.
  - i) Give two examples of Xenobiotic compound.
  - j) Give one example of biopesticide.
2. Answer the following on **any two** : **10**
- a) Discuss the role of biotechnology in environment protection.
  - b) Give the applications of Bioremediation.
  - c) Comment on ethenol production.

**P.T.O.**



3. Write short notes on **any two** of the following : **10**

a) Bioaugmentation

b) Pollutants

c) Composting.

4. What are biopesticides ? Discuss on biopesticides with suitable examples studied by you. **10**

OR

4. Give detail account of biotechnological applications to hazardous waste management. **10**

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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION – VI (Vocational)**  
**(New Course) (2008 Pattern)**  
**(Video Production)**

Time : 2 Hours

Max. Marks : 40

*Instructions :* 1) Attempt **all** questions.  
2) Draw neat and labeled diagrams **wherever** necessary.  
3) Figures to the **right** indicate **full** marks.

1. Answer the following : **10**
  - a) What is the difference between a reality show and a talent hunt show ? Explain.
  - b) Name any four fiction programs on television.
  - c) Explain the concept of SHOT.
  - d) Explain the difference between a feature film and a short film.
  - e) Explain the role of director in making any television production.
  
2. Answer **any two** of the following : **10**
  - a) Explain different types of shot.
  - b) Explain different steps involved in television production process.
  - c) Explain what do you understand by the concept 'point of view' and also explain its creative use ?
  
3. Write a script for 30 sec social advertisement on the following theme in drama format. **10**

“Manners to be followed while using mobile phone in public”.

OR
  
3. Write a script for 30 sec social advertisement on the following theme in documentary format. **10**

“Manners to be followed while using mobile phone in public”.
  
4. Write short notes on **any two** : **10**
  - a) Importance of screenplay.
  - b) Importance of characterization
  - c) Importance of research.





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**T.Y. B.Sc. (Semester – III) Examination, 2010**  
**Computer Hardware & Network Administration – VI**  
**NETWORK CONCEPTS – I (Vocational)**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

1. Attempt **all** in **one/two** sentences : **(1×10=10)**

- 1) Give two examples of Network Operating System.
- 2) What does FTP stand for ? Give its Port No.
- 3) Give one example of client-server technology.
- 4) Which layer in the OSI Model is said to be its heart ?
- 5) Give two examples of a Database servers.
- 6) What is APIPA ? Give its Range.
- 7) What does SAN mean ?
- 8) What is WINS ?
- 9) Name two protocols working on network layer.
- 10) Why DNS is significant in Internet ?

2. Attempt **any two** of the following : **(5×2=10)**

- 1) What is a VPN ? Comment on its limitations.
- 2) What are various types of Network Topologies ?
- 3) Write a note on Client Server Technology.

**P.T.O.**



3. Attempt **any two** of the following : **(5×2=10)**

- 1) Give one application of EACH : TCP/IP ; SMTP ; HTTP ; SNMP ; POP3.
- 2) What are different functions of Network Operating System ?
- 3) Explain the significance of Web Servers.

4. Attempt **any one** of the following : **(10×1=10)**

- 1) a) Explain the concept of User and Group Management.  
b) Explain the advantages of peer to peer network.

OR

- 2) Explain in brief with appropriate diagram the different layers of OSI Reference Model.



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**T.Y. B.Sc. (Vocational) (Semester – III) Examination, 2010**  
**SEED TECHNOLOGY**  
**Seed Farm Management, Processing and Storage**  
**Paper – VI (New) (2008 PATTERN)**

Time : 2 Hours

Max. Marks : 40

*Instructions :1) All questions are compulsory.*

*2) Figures to the **right** indicate **full** marks.*

*3) All questions carry **equal** marks.*

1. Attempt the following : **(10×1=10)**
- a) State one objective of farm management.
  - b) What is capital limitation ?
  - c) Enlist any two types of layouts of seed processing plant.
  - d) What is seed grading ?
  - e) Mention any one seed treating equipment.
  - f) Give any one Bagging method.
  - g) Give one objective of storage.
  - h) Give one role of seed organization in seed marketing.
  - i) What is the use of farm management as personal matter ?
  - j) What is chemical seed treatment ?

**P.T.O.**



2. Answer **any two** of the following : **(2×5=10)**

- a) Write an account on receiving the seed in seed processing unit.
- b) Give a comparative account of general and specialized farming.
- c) Explain in detail the basic requirements of seed storage.

3. Write notes on **any two** of the following : **(2×5=10)**

- a) Need of seed treatment.
- b) Fundamentals of farm management.
- c) Seed organization and its role in seed marketing

4. Explain in detail various steps in seed processing. **10**

OR

- a) Give an account of seed cleaning and separation. **(2×5=10)**
- b) Write about the factors affecting storability of seeds.

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