



[4118] – 103

Seat
No.

S.Y.B.Sc. (Semester – I) Examination, 2012
COMPUTER SCIENCE
Mathematics (Paper – I)
MTC – 211 : Linear Algebra
(2008 Pattern)

Time : 2 Hours

Total Marks : 40

Instructions : 1) **All questions are compulsory.**
2) **All questions carry equal marks.**

1. Attempt **all** questions :

10

1) Give an example of a non-zero 2×2 matrix 'A' such that, $A^2 = A$.

2) Solve the following system of linear equation :

$$x - y + z = 0.$$

3) If 1, 2, 3, 4 are the eigen values of 4×4 matrix 'A', find trace of A.

4) Let, $W = \{(x,y) \in \mathbb{R}^2 / x + y = 5\}$. Is W a subspace of \mathbb{R}^2 with usual addition and scalar multiplication ? Justify.

5) True or false : "The set $S = \{(1,1), (0,1)\}$ is linearly independent subset of \mathbb{R}^2 ". Justify.

6) State : Cayley-Hamilton theorem.

7) Define : Orthonormal basis of a vector space.

8) If A is a 4×5 matrix and row rank of A = 3, find column rank of A.

9) If $T : V \rightarrow W$ is a linear transformation, prove that, $T(-\bar{u}) = -T(\bar{u}), \forall \bar{u} \in V$.

10) Let $S = \{(-1, 0), (1, 2)\}$ be a basis for \mathbb{R}^2 . If $\bar{u} = (1, 4)$ then find $[\bar{u}]_S$.

P.T.O.



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

10

1) If λ is an eigen value of matrix A, show that, $\left[\frac{\det(A)}{\lambda} \right]$ is an eigen value of adjoint of A.

2) Solve the following system of linear equations by Gauss-Elimination method.

$$x + y + 3z = 0$$

$$x - y + z = 0$$

$$-x + 2y = 0$$

3) Let, $V = \left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} / a, b, c, d \in \mathbb{R} \right\}$ be a vector space under usual addition and scalar

multiplication. Determine whether the set, $S = \left\{ \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix} \right\}$ forms a basis for V.

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

10

1) Let $T : V \rightarrow W$ be a linear transformation. Prove that, T is one-one if and only if $\text{Ker}(T) = \{\vec{0}\}$.

2) Find a basis for the column space and rank of the matrix, $A = \begin{bmatrix} 1 & -2 & 7 & 0 \\ 1 & -1 & 4 & 0 \\ 3 & 2 & -3 & 5 \\ 2 & 2 & -1 & 3 \end{bmatrix}$.

3) Let, $A = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}$. Find all the eigen values of A and the eigen space corresponding to the smallest eigen value of matrix A.



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

10

1) a) Let, $T : \mathbb{P}_2 \rightarrow \mathbb{R}^2$ be defined as, $T(a + bx + cx^2) = (a + b, b - c)$.

Show that, T is a linear transformation, where, $\mathbb{P}_2 = \{\text{polynomials of degree } \leq 2\}$.

b) Use Gram-Schmidt process to find orthonormal basis for \mathbb{R}^3 with basis, $B = \{(1, 0, 1), (1, 0, -1), (0, 3, 4)\}$.

2) a) Find the value of 'K' for which the vector, $\bar{u} = (1, -2, k)$ in \mathbb{R}^3 is linear combination of the vectors $\bar{v} = (3, 0, -2)$ and $\bar{w} = (2, -1, -5)$?

b) For what value of 'a' does the following system has
i) unique solution
ii) infinitely many solutions.

$$(a - 3)x + y = 0$$

$$x + (a - 3)y = 0.$$



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S.Y. B.Sc. (Semester – I) Examination, 2012
COMPUTER SCIENCE
Mathematics (Paper – II)
MTC – 212 : Numerical Analysis
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of single memory, non-programmable Scientific calculator is allowed.**

1. Attempt **all** questions. 10

- i) Round off 1.53364 correct to 3 significant figures.
- ii) Evaluate $\Delta^2(a^{5x-7})$ [Take $h = 1$].
- iii) Using Newton-Raphson method, obtain the formula to find the cube root of 'p'.
- iv) Write the formula for $\frac{dy}{dx}$ using Newton's backward difference formula for non-tabular values of x.
- v) Prove that : $E^{-1} = 1 - \nabla$.
- vi) Define relative error and percentage error.
- vii) State true or false : Every equation of the n^{th} degree has only $(n - 1)$ roots. Justify.
- viii) If $f(0) = 1, f(1) = 2.72, f(2) = 7.39, f(3) = 20.09$ and $f(4) = 54.60$, find $\int_0^4 f(x) dx$ using Simpson's $\left(\frac{1}{3}\right)^{\text{rd}}$ rule.
- ix) Write Runge-Kutta formula of second order for ordinary differential equation.
- x) Given $\frac{dy}{dx} + y = 1; y(0) = 0$, find $y(0.1)$ using Euler's method.

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

- i) Find a polynomial $f(x)$ for the following data. Also find $f(2)$.

| | | | | |
|---|-----|---|---|----|
| x | 0 | 1 | 3 | 4 |
| y | -12 | 0 | 6 | 12 |



- ii) Find a real root of the equation $x^3 - 9x + 1 = 0$, using the bisection method correct to two decimal places.
- iii) Solve the following system of equations by Gauss-Seidel iterative method.

$$2x - y + z = 5$$

$$x + 3y - 2z = 7$$

$$x + 2y + 3z = 10$$

[Perform 4 iterations]

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

10

- i) From the following table, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 3$.

| | | | | | | |
|----------|------|----------|---------|---------|-------|----|
| x | 3 | 3.2 | 3.4 | 3.6 | 3.8 | 4 |
| y | - 14 | - 10.032 | - 5.296 | - 0.256 | 6.672 | 14 |

- ii) State and prove Newton’s forward interpolation formula for equally spaced points.
- iii) Using divided differences, find the value of $f'(8)$, given that : $f(6) = 1.556$, $f(7) = 1.690$, $f(9) = 1.908$ and $f(12) = 2.158$.

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

10

- i) a) Evaluate the integral $I = \int_0^{\pi/2} \sin x \, dx$ by using Trapezoidal rule

[Take $h = \frac{\pi}{20}$].

- b) State and derive Simpson’s $\left(\frac{1}{3}\right)^{\text{rd}}$ rule for numerical integration.

- ii) a) Given that $\frac{dy}{dx} = x^2 + y^2$, with $y(0)=0$, find $y(0.4)$ using Runge-Kutta method of fourth order [Take $h = 0.2$].

- b) Determine the value of $y(0.1)$ correct upto 3 decimal places using Euler’s modified method, where $\frac{dy}{dx} = y - \frac{2x}{y}$; $y(0)=1$.



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S.Y. B.Sc. (Semester – I) Examination, 2012
COMPUTER SCIENCE
CS – 211 : Data Structures Using ‘C’
(Paper – I) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

1. Attempt **all** of the following : **(1×10=10)**

- a) Define the term data structures.
- b) What is the best case and worst case time complexity of merge sort ?
- c) Define Balance Factor.
- d) Linked list is a linear data structure. State true or false. Justify.
- e) List out the areas in which data structures are applied extensively.
- f) Define Big O notation.
- g) A complete graph has $\frac{n(n+1)}{2}$ edges. State true or false. Justify.
- h) Define AOV network.
- i) Define Dequeue.
- j) Convert the following infix expression to postfix form $(A * B * C) / ((F * G) - D)$.

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

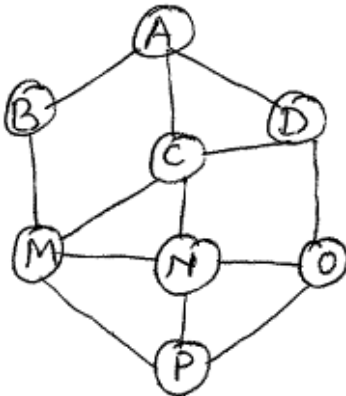
- a) Write a C function to insert a node in a doubly linked list at a given position.
- b) Write insert and delete functions in C to implement operations of a Linear Queue (Use Dynamic representation).
- c) Write a function in C to count non-leaf nodes in a Binary tree.

P.T.O.



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

- a) Construct an AVL tree for the following data :
SAF, CAN, IND, AVG, ENG, WID, SRI, ZIM, NZD, BAN.
- b) Show the stack contents and the output while converting the following infix expression to prefix expression :
 $(A + B * C - D) / E \$ F$
- c) Consider the following graph. Traverse the graph in DFS. Also show the steps consider A as a starting vertex.



4. Attempt either **A** or **B** : **(1×10=10)**

- A) 1) Define the following terms : **4**
 - i) Topological sort
 - ii) Skewed Binary Tree
 - iii) Priority Queue
 - iv) Max Heap Tree.
- 2) Consider the following in-fix expression covert to postfix and evaluate.
Show the stack contents for evaluation
 $p * q - r / s, p = 1, q = 3, r = 4, s = 2$ **3**
- 3) Sort the following data using insertion sort method : **3**
21, 3, 5, 12, 11, 17, 26

OR



B) 1) Give the output of the following code : 4

```
{ int i = 1, x, y, z ;  
  initstack ( ) ;  
  while ( i < 5)  
  {  
    push (i * 2) ;  
    i = i + 1 ;  
  }  
  x = pop ( ) ;  
  y = pop ( ) ;  
  Push (i * 1) ;  
  z = POP ( ) ;  
  push (x + y) ;  
  push (x + z) ;  
  while (! stackempty ( ) )  
    printf (“\n %d”, pop ( ) ) ;  
}
```

Also explain the steps of the output.

2) Give the different methods to traverse a tree. 3

3) What is Generalized Linked List ? Explain with example. Also write its applications. 3



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S.Y.B.Sc. (Semester – I) Examination, 2012
COMPUTER SCIENCE
(New) (2008 Pattern) (Paper – II)
CS-212 : Relational Database Management System

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All** questions carry **equal** marks.
 - 2) **All** questions are **compulsory**.
 - 3) **Black** figures to the **right** indicate **full** marks.

1. Attempt **all** of the following : **(1×10=10)**

- a) What is AUTO_INCREMENT modifier ?
- b) Write any two string functions in MYSQL with example.
- c) Enlist various operators of MYSQL.
- d) What is a check point ?
- e) What is meant by starvation ?
- f) What is the lost update problem ?
- g) What is the output of the following ?

Select ROUND (74.50)
- h) What is a stored procedure ?
- i) What are different Database middleware components ?
- j) What is 2 phase Locking Protocol ?

P.T.O.



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

- a) What is a trigger ? Explain how to create a trigger with proper example.
- b) Discuss different types of transaction failure.
- c) What is deadlock state ? Explain Deadlock prevention schemes.

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

a) Consider the following transactions.

| T₁ | T₂ | T₃ |
|----------------------|----------------------|----------------------|
| Read (X) | Read (X) | Read (Z) |
| Read (Y) | Read (Z) | Read (Y) |
| Y=Y-X | X = X + Z | Y = Y + Z |
| Write (Y) | Write (X) | Write (Y) |

Give any 2 non-serial schedules that are serializable.

b) Consider the following tables.

Book(b_no, bname, publisher, price)

Author(a_no, a_name, address)

Relationship between Book and Author is many to many.

Solve the following queries.

- 1) Display the no of books of each Author
- 2) Display all details of books written by 'Kanetkar'.

c) What is a transaction ? Explain ACID property in detail.



4. Attempt the following :

(2×5=10)

a) The following is an interleaved execution of set of transactions T_0, T_2, T_3 with 2 phase locking protocol.

| T_1 | T_2 | T_3 |
|-------------|-------------|-------------|
| Lock (A, X) | | |
| | Lock (B, S) | |
| | | Lock (A, S) |
| Lock (C, X) | | |
| | Lock (D, X) | |
| Lock (D, S) | | |
| | Lock (C, S) | |

Construct a wait for graph according to the above schedule. Is there a dead lock at any Instance ?

b) Explain recoverable and non-recoverable schedule with example.

OR

b) Explain Client-server interaction in detail.



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S.Y. B.Sc. (Semester – I) Examination, 2012
Computer Science
ELECTRONICS (Paper – I)
ELC – 211 : Microprocessor Architecture and Programming
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 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 in **one** or **two** sentences : **(1×10=10)**

- a) Name the data terminal equipment and data communication equipment when RS232 is used for serial communication.
- b) What is the role of segment register in protected mode of pentium operation ?
- c) What does the following instructions do
 - i) CMC
 - ii) CLC
- d) Mention any two features of NASM assembler.
- e) Define virtual memory.
- f) What is the width of address and data bus of a basic pentium machine ?
- g) What will be the result of NOT CX if CX contains 3250 H ?
- h) Mention one advantage and one disadvantage of using a flowchart.
 - i) In memory stack why stack is initialized at the highest memory address ?
 - j) What is the use of REPZ instruction ?

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

- a) Explain with a proper block diagram the general register organisation of a CPV.

P.T.O.



- b) Give the function of the following flags of Pentium.
 - 1) Carry
 - 2) Overflow
 - 3) Parity
 - 4) Direction flag
 - 5) Trap-flag.
- c) What is the need for Interrupt Vector Table ? How does processor handle multiple interrupt ?

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

- a) Write an assembly language program for finding out the smallest number from an array of 6 numbers. Smallest number should be stored in AL register.
- b) Explain the memory management using the technique of paging.
- c) Write the function of the following blocks of Pentium processor.
 - 1) Floating Point Unit
 - 2) Instruction Cache
 - 3) U and V pipeline
 - 4) TLB
 - 5) Prefetch Buffer.

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

- a) 1) Explain with block diagram a typical input / output interface.
- 2) Write a program to read 10 numbers from the keyboard and store them in an array which is initialised in the data segment.

OR

- b) 1) Write a program to convert 8-bit Binary number into Decimal. Display the decimal number at the output.
- 2) What will be the output of the following instructions if AL contains 89H ?
 - i) SHL AL, 3
 - ii) ROL AL, 3
 - iii) RCR AL, 3 (Assume initial carry is 1)
 - iv) XOR AL, AL
 - v) INC AL



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S.Y. B.Sc. (Semester – I) Examination, 2012
Computer Science
ELECTRONICS (Paper – I)
ELC – 211 : Microprocessor Architecture and Programming
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 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 in **one** or **two** sentences : **(1×10=10)**

- a) Name the data terminal equipment and data communication equipment when RS232 is used for serial communication.
- b) What is the role of segment register in protected mode of pentium operation ?
- c) What does the following instructions do
 - i) CMC
 - ii) CLC
- d) Mention any two features of NASM assembler.
- e) Define virtual memory.
- f) What is the width of address and data bus of a basic pentium machine ?
- g) What will be the result of NOT CX if CX contains 3250 H ?
- h) Mention one advantage and one disadvantage of using a flowchart.
 - i) In memory stack why stack is initialized at the highest memory address ?
 - j) What is the use of REPZ instruction ?

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

- a) Explain with a proper block diagram the general register organisation of a CPV.

P.T.O.



- b) Give the function of the following flags of Pentium.
 - 1) Carry
 - 2) Overflow
 - 3) Parity
 - 4) Direction flag
 - 5) Trap-flag.
- c) What is the need for Interrupt Vector Table ? How does processor handle multiple interrupt ?

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

- a) Write an assembly language program for finding out the smallest number from an array of 6 numbers. Smallest number should be stored in AL register.
- b) Explain the memory management using the technique of paging.
- c) Write the function of the following blocks of Pentium processor.
 - 1) Floating Point Unit
 - 2) Instruction Cache
 - 3) U and V pipeline
 - 4) TLB
 - 5) Prefetch Buffer.

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

- a)
 - 1) Explain with block diagram a typical input / output interface.
 - 2) Write a program to read 10 numbers from the keyboard and store them in an array which is initialised in the data segment.

OR

- b)
 - 1) Write a program to convert 8-bit Binary number into Decimal. Display the decimal number at the output.
 - 2) What will be the output of the following instructions if AL contains 89H ?
 - i) SHL AL, 3
 - ii) ROL AL, 3
 - iii) RCR AL, 3 (Assume initial carry is 1)
 - iv) XOR AL, AL
 - v) INC AL



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S.Y. B.Sc. (Semester – I) Examination, 2012
Computer Science
ELECTRONICS (Paper – II)
ELC 212 : Process Control Instrumentation
(Old Course)

Time : 2 Hours

Max. Marks : 40

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

1. Answer the following in **one** or **two** sentences. **(1×10=10)**
- a) Define resolution of a sensor.
 - b) What is acquisition time of S/H circuit ?
 - c) An object from the laser source is at a distance of 9×10^8 m, how much time it will take to reach back the source ?
 - d) What is Data Acquisition System ?
 - e) State working principle of thermocouple.
 - f) Write an output equation of a controller in integral mode.
 - g) Give two examples of On-Off controller.
 - h) Write an expression for a gauge factor in a semiconductor strain gauge.
 - i) PSPICE stands for _____
 - j) Write any two signal conditioning techniques.

P.T.O.



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

- a) Write basic principle of thermal sensor differentiate between RTD and thermistor.
- b) Explain the working of sample and hold circuit with neat diagram.
- c) The output of an op-amp based proportional controller is –20V corresponding to 0% output and 15V for 100% output. Determine the actual O/P for 90% controller O/P.

3. Attempt **any two** : **(5×2=10)**

- a) Explain the working principle of LVDT state. Its any two applications.
- b) List and define any four parameters of DAS.
- c) Describe the working of four position stepper motor.

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

- a) i) Explain photomultiplier cell with a neat diagram.
ii) With neat block diagram, explain elements of process control loop.
- b) i) Derive the first order differential equation for a mercury thermometer.
ii) Define integral controller.

An integral controller has gain of $K_I = -0.35\%$ controller output per second per percentage error. Determine the controller output after 5 seconds for a constant error of 20%. The controller O/P is 15% initially.



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S.Y. B.Sc. (Semester – II) Examination, 2012
COMPUTER SCIENCE

CS – 221 : Object Oriented Concepts and Programming in C++ (Paper – I)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) **All** questions are **compulsory**.
3) **All** questions carry **equal** marks.

1. Attempt **all** of the following : **(1×10=10)**
- a) How does function overriding differ from function overloading ?
 - b) State the purpose of “this” pointer.
 - c) A destructor can be overloaded in a class. State True/False.
 - d) Define abstract class.
 - e) What is the difference between the following C++ statements ?
`int *ptr = new int(10) ;`
`int *ptr = new int [10] ;`
 - f) State the advantage of encapsulation.
 - g) Give any two ways to check the success or failure of a file open operation.
 - h) List the types of STL containers.
 - i) An exception can be thrown again after catching it. State True/False.
 - j) What is the purpose of forward declaration of a class ?
2. Attempt **any two** of the following : **(2×5=10)**
- a) Write a short note on constructors in a derived class. Illustrate with a suitable example.
 - b) Write the syntax of overloading the insertion and extraction operators. Also state the important rules for operator overloading.

P.T.O.



- c) Consider a class “Game” which has no-of-players and names of players. The number of players can vary for each Game object. Define the class with an appropriate dynamic constructor to initialize the object and accept players names. Also write a member function to display details.

For example : `Game chess (2); // create object with 2 names.`

`Chess. display (); //displays names`

`Game cricket (11); //create object with // 11 names`

`Cricket.display (); //displays 11 names .`

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

- What is polymorphism ? Illustrate runtime polymorphism by a suitable example.
- A file “student.txt” contains roll numbers and names. Write a C++ program to read the contents of this file and search for a student having a specific roll number.
- Define a base class “Item” (item-no, name, price). Derive a class “Discounted-Item” (discount-percent). A customer buys ‘n’ items. Calculate the total price, total discount and display the bill using appropriate output formats.

4. Attempt **any one** of the following (A or B) **(1×10=10)**

- A) 1) What is a generic function ? Explain how it can be overloaded ? **4**

- 2) Write a short note on reference variables. **3**

- 3) What will be the output of the following code ? (Assume there are no syntax errors)

`ostream & form (ostream & out) 3`

`{`

`out <<set w (10);`

`out <<setprecision (2);`

`out <<setfill (“*”); return out;`

`}`

`void main ()`

`{`

`cout.setf(ios::left);`

`cout <<form<<123.1234<<“Rs”<<endl;`

`cout.setf(ios::right);`

`cout <<form<< 123.1234<<“Rs”<<endl;`

`}`



- B) 1) What is an exception ? Explain the different ways of using the throw keyword. 4
- 2) What will be the output of the following code ? (Assume there are no syntax errors) 3

```
class B
{
    Public :
    void f1() { cout <<"In base f1" <<endl;}
    virtual void f2(){cout<<"In base f2" <<endl;}
    virtual ~ B () { cout << "In base destructor <<endl;}
};
class D : public B
{
    public :
    void f1() { cout <<"In derived f1"<<endl;}
    void f2 () { cout <<"In derived f2" <<endl; }
    ~D () { cout <<"In derived destructor" <<endl; }
};
void main ()
{ B *ptr = new D;
  ptr → f1();
  ptr → f2 ();
  delete ptr;
}
```

3. Identify errors in the following code. 3

```
Class A
{ int x,y;
  public :
  void A (int a = 0, int b)
  {x = a; y=b;}
  void display ()
  { cout <<x<<y ; }
};
void main ()
{ A *ptr ;
  ptr → display ();
}
```



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S.Y. B.Sc. (Semester – II) Examination, 2012
COMPUTER SCIENCE
CS-222 : Software Engineering
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- i) All questions are **compulsory**.*
 - ii) All questions carry **equal** marks.*
 - iii) Figures to the **right** indicate **full** marks.*

1. Attempt **all** of the following : **(1×10=10)**
- a) What is Artificial Intelligence Software ?
 - b) Define sprint backlog.
 - c) State the problems faced during requirement elicitation.
 - d) Define data objects.
 - e) What is meant by software process ?
 - f) What is the use of system simulation ?
 - g) What do you mean by stakeholder ?
 - h) What is Risk Analysis ?
 - i) What is requirement analysis ?
 - j) What is meant by coupling ?
2. Attempt **any two** of the following : **(2×5=10)**
- a) Explain quality function deployment.
 - b) Explain any five principles to achieve agility.
 - c) What is prototyping ? Explain the steps in prototyping.

P.T.O.



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

- a) Explain framework activities for personal software process [PSP].
- b) Explain any five principles for planning practices.
- c) Explain McCalls quality factors of software.

4. Attempt the following : **(2×5=10)**

- a) Explain Negotiating requirement.

OR

- a) Explain the factors that should be considered while constructing system model.
- b) Draw context level DFD, first level DFD and E-R diagram for “College Admission System”.



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S.Y. B.Sc. (Semester – II) Examination, 2012
COMPUTER SCIENCE
CS-222 : Software Engineering
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- i) All questions are **compulsory**.*
 - ii) All questions carry **equal** marks.*
 - iii) Figures to the **right** indicate **full** marks.*

1. Attempt **all** of the following : **(1×10=10)**
- a) What is Artificial Intelligence Software ?
 - b) Define sprint backlog.
 - c) State the problems faced during requirement elicitation.
 - d) Define data objects.
 - e) What is meant by software process ?
 - f) What is the use of system simulation ?
 - g) What do you mean by stakeholder ?
 - h) What is Risk Analysis ?
 - i) What is requirement analysis ?
 - j) What is meant by coupling ?
2. Attempt **any two** of the following : **(2×5=10)**
- a) Explain quality function deployment.
 - b) Explain any five principles to achieve agility.
 - c) What is prototyping ? Explain the steps in prototyping.

P.T.O.



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

- a) Explain framework activities for personal software process [PSP].
- b) Explain any five principles for planning practices.
- c) Explain McCalls quality factors of software.

4. Attempt the following : **(2×5=10)**

- a) Explain Negotiating requirement.

OR

- a) Explain the factors that should be considered while constructing system model.
- b) Draw context level DFD, first level DFD and E-R diagram for “College Admission System”.



[4118] – 203

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S.Y. B.Sc. (Semester – II) Examination, 2012
COMPUTER SCIENCE
MATHEMATICS (Paper – I)
MTC – 221 : Computational Geometry
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the **right** indicate **full** marks.*
3) *Use of single memory non-programmable scientific calculator is **allowed**.*

1. Attempt the following :

10

- i) The line segment joining A [5 6] and B [- 4 4] is scaled uniformly by factor 8 units. What is the midpoint of the transformed line segment ?
- ii) Write the transformation matrix for shear in z-co-ordinate proportional to x-co-ordinate and y-co-ordinate by factors – 3 and – 6 units respectively.
- iii) Write the transformation matrix for rotation about y-axis through an angle $\left(\frac{\pi}{6}\right)^c$.
- iv) Explain the term perspective projection.
- v) Find the value of δ to generate 16 points on the parabolic segment in the first quadrant for $8 \leq y \leq 28$, where equation of parabola is $y^2 = 8x$.
- vi) Define : Foreshortening factor.
- vii) Find the concatenated transformation matrix to create the right hand side view of an object.
- viii) Define : Interpolate and approximate the set of control points.

P.T.O.



- ix) What is meant by solid body transformation ?
- x) The ΔABC with position vectors A [1 0], B [0 1] and C [- 1 0] is transformed by $[T] = \begin{bmatrix} 3 & 2 \\ -1 & 2 \end{bmatrix}$ to new $\Delta A'B'C'$. Find the area of a new $\Delta A'B'C'$.

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

10

- i) Derive the conditions under which 2×2 transformation matrix $[T]$ preserve magnitude and angle between two vectors.

- ii) Lines AB and EF are transformed to the lines $A'B'$ and $E'F'$ respectively by

using transformation matrix $[T] = \begin{bmatrix} 1 & 2 \\ 1 & -3 \end{bmatrix}$.

If $A \equiv [-1 \ 1]$, $B \equiv \left[3 \ \frac{5}{3}\right]$, $E \equiv \left[-\frac{1}{2} \ \frac{3}{2}\right]$ and $F \equiv [3 \ -2]$

Find the point of intersection of $A'B'$ and $E'F'$.

- iii) Reflect the ΔABC having position vectors A [2 4], B [4 6] and C [2 6] through the line L : $x - 2y + 4 = 0$. Write combined transformation matrix.

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

10

- i) What is the difference between cavalier projection and cabinet projection ? Develop the transformation matrix for an oblique projection and hence find the conditions for cavalier and cabinet projection.

- ii) Determine the dimetric projection if the foreshortening factor along z-axis is

$\frac{1}{5}$ with $\phi > 0, \theta > 0$.

- iii) Show that the parabola $y^2 = x$ is transformed to origin centred unit circle

under the transformation $[T] = \begin{bmatrix} 0 & -2 & 2 \\ -2 & 2 & -2 \\ 1 & 0 & 1 \end{bmatrix}$

Also show that, the point P [1 1 1] lies on the parabola $y^2 = x$ and find the corresponding point on the unit circle.



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

10

a) i) State general parametric equation of the Be'zier curve and also obtain matrix representation of the Be'zier cubic curve.

ii) Generate uniformly spaced 5 points on the hyperbolic segment in the first quadrant for $6 \leq x \leq 12$, where the equation of the hyperbola is,

$$\frac{x^2}{9} - \frac{y^2}{4} = 1.$$

b) i) Consider the line with direction ratios 1, - 2, 2 and passing through the origin. Determine the angles through which the line should be rotated about x-axis and then about y-axis, so that it coincides with z-axis.

ii) Obtain an algorithm to generate uniformly spaced n points on the ellipse

$$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1.$$



[4118] – 203

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S.Y. B.Sc. (Semester – II) Examination, 2012
COMPUTER SCIENCE
MATHEMATICS (Paper – I)
MTC – 221 : Computational Geometry
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the **right** indicate **full** marks.*
3) *Use of single memory non-programmable scientific calculator is **allowed**.*

1. Attempt the following :

10

- i) The line segment joining A [5 6] and B [- 4 4] is scaled uniformly by factor 8 units. What is the midpoint of the transformed line segment ?
- ii) Write the transformation matrix for shear in z-co-ordinate proportional to x-co-ordinate and y-co-ordinate by factors – 3 and – 6 units respectively.
- iii) Write the transformation matrix for rotation about y-axis through an angle $\left(\frac{\pi}{6}\right)^c$.
- iv) Explain the term perspective projection.
- v) Find the value of δ to generate 16 points on the parabolic segment in the first quadrant for $8 \leq y \leq 28$, where equation of parabola is $y^2 = 8x$.
- vi) Define : Foreshortening factor.
- vii) Find the concatenated transformation matrix to create the right hand side view of an object.
- viii) Define : Interpolate and approximate the set of control points.

P.T.O.



- ix) What is meant by solid body transformation ?
- x) The ΔABC with position vectors A [1 0], B [0 1] and C [-1 0] is transformed by $[T] = \begin{bmatrix} 3 & 2 \\ -1 & 2 \end{bmatrix}$ to new $\Delta A'B'C'$. Find the area of a new $\Delta A'B'C'$.

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

10

- i) Derive the conditions under which 2×2 transformation matrix $[T]$ preserve magnitude and angle between two vectors.

- ii) Lines AB and EF are transformed to the lines $A'B'$ and $E'F'$ respectively by

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If $A \equiv [-1 \ 1]$, $B \equiv \left[3 \ \frac{5}{3}\right]$, $E \equiv \left[-\frac{1}{2} \ \frac{3}{2}\right]$ and $F \equiv [3 \ -2]$

Find the point of intersection of $A'B'$ and $E'F'$.

- iii) Reflect the ΔABC having position vectors A [2 4], B [4 6] and C [2 6] through the line L : $x - 2y + 4 = 0$. Write combined transformation matrix.

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

10

- i) What is the difference between cavalier projection and cabinet projection ? Develop the transformation matrix for an oblique projection and hence find the conditions for cavalier and cabinet projection.

- ii) Determine the dimetric projection if the foreshortening factor along z-axis is

$\frac{1}{5}$ with $\phi > 0, \theta > 0$.

- iii) Show that the parabola $y^2 = x$ is transformed to origin centred unit circle

under the transformation $[T] = \begin{bmatrix} 0 & -2 & 2 \\ -2 & 2 & -2 \\ 1 & 0 & 1 \end{bmatrix}$

Also show that, the point P [1 1 1] lies on the parabola $y^2 = x$ and find the corresponding point on the unit circle.



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

10

a) i) State general parametric equation of the Be'zier curve and also obtain matrix representation of the Be'zier cubic curve.

ii) Generate uniformly spaced 5 points on the hyperbolic segment in the first quadrant for $6 \leq x \leq 12$, where the equation of the hyperbola is,

$$\frac{x^2}{9} - \frac{y^2}{4} = 1.$$

b) i) Consider the line with direction ratios 1, - 2, 2 and passing through the origin. Determine the angles through which the line should be rotated about x-axis and then about y-axis, so that it coincides with z-axis.

ii) Obtain an algorithm to generate uniformly spaced n points on the ellipse

$$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1.$$





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S.Y. B.Sc. (Semester – II) Examination, 2012
Computer Science
MATHEMATICS (Paper – II)
MTC – 222 : Operations Research
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.
3) **Use** of single memory, non-programmable Scientific calculator is **allowed**.
4) Graph papers will be **supplied** on demand.

1. Attempt **all** questions : **10**

- i) Give any two application areas of operations research.
- ii) Draw the graph and highlight the feasible region for the given constraints

$$3x + y \leq 6$$

$$x + 2y = 4$$

- iii) A transportation problem has a feasible solution as given below :

| | | |
|----|---|----|
| 10 | 4 | |
| 20 | | 15 |

14

35

30 4 15

Why the given solution is non-degenerated ?

- iv) Explain in brief : North-West Corner method.
- v) Write the dual of the following LPP :

$$\text{Max } Z = 7y_1 + 9y_2$$

Subject to

$$y_1 + 2y_2 \leq 1$$

$$-y_1 + 3y_2 \leq 2$$

Where y_1, y_2 are unrestricted variables.

- vi) Define basic feasible solution in LPP.
- vii) Write any two application of assignment problems.



viii) Solve the following assignment problem for minimizing total time for doing all jobs :

| | I | II | III |
|---|---|----|-----|
| A | 9 | 4 | 8 |
| B | 3 | 7 | 4 |
| C | 6 | 5 | 2 |

ix) Define : Two-person zero-sum game.

x) Find minimax and maximin for the following matrix :

$$\begin{bmatrix} -2 & -1 & 5 \\ 2 & 1 & 3 \\ 4 & 2 & -3 \end{bmatrix}$$

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

10

i) A manufacturer produces bicycles and tricycles each of which must be processed through two machines A and B. Machine A has maximum of 130 hours available and machine B has a maximum of 170 hours available. Manufacturing a tricycle requires 5 hours on machine A and 3 hours on machine B. Manufacturing a bicycle requires 8 hours on machine A and 10 hours on machine B. If profits are Rs. 55 for a tricycle and Rs. 75 for a bicycle, formulate the problem as a linear programming problem to have maximum profit.

ii) Solve the following linear programming problem by simplex method :

Minimize (Z) = $x_1 + x_2$

Subject to

$$\begin{aligned} 2x_1 + x_2 &\geq 4 \\ x_1 + 7x_2 &\geq 7 \\ x_1, x_2 &\geq 0 \end{aligned}$$

iii) Solve the following assignment problem for minimization where no assignment can be of job 1 to machine A.

| | | Machines | | | | |
|------|---|----------|---|---|---|---|
| | | A | B | C | D | E |
| Jobs | 1 | - | 4 | 7 | 3 | 4 |
| | 2 | 4 | 2 | 6 | 3 | 4 |
| | 3 | 7 | 6 | 5 | 7 | 5 |
| | 4 | 3 | 3 | 7 | 6 | 7 |
| | 5 | 4 | 4 | 5 | 7 | 3 |



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

10

i) Solve the following 5 × 2 game graphically :

| | | | |
|-----------------|------------|-----------------|----|
| | | Player B | |
| | | I | II |
| Player A | I | -2 | 5 |
| | II | -5 | 3 |
| | III | 0 | -2 |
| | IV | -3 | 0 |
| | V | 1 | -4 |

ii) Solve the following transportation problem by least cost method :

| | | | | | | | |
|---------------|----------------------|----------------------|----------------------|----------------------|----------------------|--|---------------|
| | To → | | | | | | |
| | | D₁ | D₂ | D₃ | D₄ | | Supply |
| From ↓ | | | | | | | |
| | O₁ | 30 | 25 | 40 | 20 | | 100 |
| | O₂ | 29 | 26 | 35 | 40 | | 250 |
| | O₃ | 31 | 33 | 37 | 30 | | 150 |
| | Demand | 90 | 160 | 200 | 50 | | |

iii) Solve the following assignment problem for maximization :

| | | | | |
|------------|----------|----------|----------|----------|
| | A | B | C | D |
| I | 100 | 140 | 280 | 70 |
| II | 130 | 160 | 200 | 60 |
| III | 80 | 130 | 300 | 90 |
| IV | 150 | 110 | 250 | 50 |



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

10

i) a) Reduce the following game by dominance principle and solve it :

| | | | | | |
|-----------------|-----|-----------------|----|-----|----|
| | | Player B | | | |
| | | I | II | III | IV |
| Player A | I | 3 | 2 | 4 | 0 |
| | II | 3 | 4 | 2 | 4 |
| | III | 4 | 2 | 4 | 0 |
| | IV | 0 | 4 | 0 | 8 |

b) Solve graphically the following linear programming problem :

$$\text{Max } Z = 3x_1 + 2x_2$$

$$\text{Subject to } x_1 - x_2 \leq 1$$

$$x_1 + x_2 \geq 3$$

$$x_1, x_2 \geq 0$$

ii) Find the initial basic feasible solution of the following transportation problem by VAM method and obtain its optimal solution by MODI method :

| | | | | | | |
|----------------|---------------|----------------|----------------|----------------|----------------|--------|
| Origin ↓ | Destination → | | | | | |
| | | D ₁ | D ₂ | D ₃ | D ₄ | Supply |
| O ₁ | | 9 | 5 | 8 | 5 | 225 |
| O ₂ | | 9 | 10 | 13 | 7 | 75 |
| O ₃ | | 14 | 5 | 3 | 7 | 100 |
| Demand | | 225 | 80 | 95 | 100 | |



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S.Y. B.Sc. (Semester – II) Examination, 2012
Computer Science
ELECTRONICS (Paper – I)
ELC 221 : Microcontroller and Embedded Systems
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 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 in **one** or **two** sentences. **(1×10=10)**
- a) List any two internal interrupts of 8051.
 - b) What will registers A and B hold after a DIV AB instruction is executed ?
 - c) Which port of 8051 does not exhibit dual function ?
 - d) Give the contents of TMOD register to select timer 1 in mode 1.
 - e) If the crystal frequency connected to 8051 is 16 MHz, what will be the clock input to the timer unit ?
 - f) Give the function of SBUF register in 8051.
 - g) Give the addresses in the IVT for serial communication interrupt and external interrupt O.
 - h) What is the resolution of ADC ?
 - i) Define embedded system.
 - j) List any two software tools used to design an embedded system.

P.T.O.



2. Attempt **any two** of the following : **(2×5=10)**
- a) Write an assembly language program to generate a square wave of 10 KHz and 50% duty cycle on P1.3. Use Timer 0 in mode 2. (Crystal frequency = 12 MHz).
 - b) Write down the addressing modes used in the following instructions.
 - 1) MOV A, R3
 - 2) MOV @ R0, A
 - 3) MOV R0, 50
 - 4) ADD A, #30
 - 5) MOVC A, @A + DPTR.
 - c) Write an assembly language program to monitor P1.6. When it becomes 0, accept 8 bit data from Port 0 and send it to Port 2. Also exclusive OR the data with 0F0H and store the result in location 50 H of RAM.
3. Attempt **any two** of the following : **(2×5=10)**
- a) Write an assembly language program to accept 10 numbers from port 1 and store them in RAM locations starting from 50H.
 - b) Draw the bit format of TCON register. Explain the function of the upper four bits of TCON register.
 - c) Draw the bit format of IE register. Explain the function of each bit.
4. Attempt **any one** of the following : **(1×10=10)**
- a) i) Write in brief the classification of embedded systems.
ii) How are interrupts processed in 8051 ? Write an instruction to enable serial interrupt.

OR
 - b) i) With the help of neat diagram show how DAC 0808 is interfaced to 8051. Write an assembly language program to generate a saw tooth waveform.
ii) Identify the type of instruction for the following instructions :
 - 1) MOVX A, @DPTR
 - 2) INC R5
 - 3) DJNZ R5, back
 - iii) What is the role of RAM in embedded systems ?



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S.Y. B.Sc. (Semester – II) Examination, 2012
Computer Science
ELECTRONICS (Paper – II)
ELC-222 : Digital Signal Processing
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions:**
- 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 in **one** or **two** sentences : **(1×10=10)**

- a) What is the role of Barrel shifter ?
- b) List any two advantages of digital filters.
- c) For a CT signal if the maximum frequency of a input signal is 3.4 KHz, what should be the minimum sampling frequency ?
- d) List any two characteristics of ADC.
- e) Define Z-transform for a DT signal.
- f) What is role of MAC in digital signal processors ?
- g) In decoding technique used for a CD player EFM stands for _____
- h) Represent $x(n) = \{1, -1, 2, 0, 1, -2, 1\}$ in tabular format.
- i) Draw basic block diagram of Von Neumann architecture.
- j) Find Laplace transform of unit impulse signal.

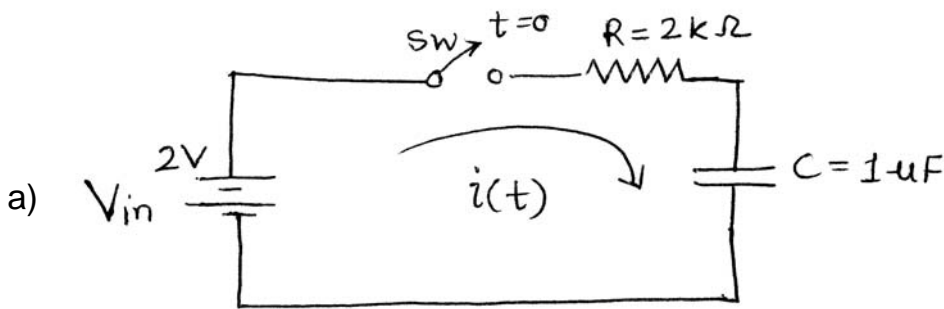
P.T.O.



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

- a) Explain following types of signals with suitable examples :
 - i) Multichannel and multidimensional signals.
 - ii) Even and odd signals.
- b) Differentiate between digital signal processors and traditional microprocessors.
- c) Explain the role of digital signal processing in Seismographical analysis.

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



Analyze the above circuit using Laplace transform. Assume that initial voltage across capacitor $V_c(0) = 1V$.

- b) Explain speech recognition system with a suitable diagram.
- c) With a neat block diagram explain DSP system.

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

- a) i) What is significance of correlation in DSP ? Explain cross correlation and autocorrelation. 5
 - ii) Explain Sigma Delta DAC with a suitable diagram. 5
- OR
- b) i) Differentiate between fixed point and floating point processors. 5
 - ii) Explain the concept of digital filter using neat block diagram. 5



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S.Y.B.Sc. (Semester – II) Examination, 2012
COMPUTER SCIENCE
Compulsory English
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

- A) Shikha, Rohit, Arya and Rhea are asked to have a Group Discussion on “Traffic Menace in Pune”. Write the transcript of the discussion in a dialogue form. 5
- B) You are attending an interview for the post of an Executive Manager in “Global Netizens Company”. Write down 5 questions you could be asked by the interviewer along with their possible responses. 5
- C) Write five remarks which you will use to conclude a meeting. 5

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

- A) Write a paragraph on “College Fests”. 5
- B) Re-arrange the jumbled sentences below to form a well-written paragraph.
- 1) Thesauruses come in two-easy-to-use forms, the dictionary form and index form.
 - 2) A thesaurus is a book that organises words by categories and concepts.
 - 3) It is a valuable tool in vocabulary building.
 - 4) In other words, a thesaurus is a collection of synonyms and antonyms.
 - 5) In the dictionary form, words are arranged alphabetically and in index form, words are classified by meaning. 5
- C) Write a Review of a film which you have seen recently. 5

P.T.O.



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

A) Write a summary note of the passage given below. **5**

The earth itself becomes our enemy when an earthquake strikes. Every country in the world is threatend by the tremendous fury of earthquakes. Their power exceeds all the forces released by humankind. When a city is hit, buildings fall and explosions and fires are started. Underground railways are wrecked. Gaping crevices appear on streets. Huge tidal waves rise on the sea. An earthquake in Lisbon in 1755 destroyed the city and killed 450 persons. The subcontinent of Alaska was pushed 80 feet into the sea in 1968. Faced with such tremendous forces, which cannot be resisted, scientist can only pinpoint the earthquake areas and take suitable steps to minimize the harm. (**130 words**).

B) Punctuate the following sentences : **5**

- 1) In japan, many people were hit by Tsunami.
- 2) How lucky he is
- 3) Alisha seems happy today she is jumping and dancing.
- 4) He is a tall big-built man.
- 5) Why does this always happen to me.

C) Write a description of your neighbour conveying his characteristic features and moods. **5**

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

A) Prepare 5 slides of about 20 words each for power point presentation that you would make for a seminar on “Communication Skills”. **5**

B) You are the Sports Director of your college. Write an e-mail to gamesparadise @ yahoo.com giving them the order of sports equipments required for your college Gymkhana. **5**

C) Write a note on the use of audio-visual aids in communication and presentation. **5**



[4118] – 207

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S.Y.B.Sc. (Semester – II) Examination, 2012
COMPUTER SCIENCE
Compulsory English
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

- A) Shikha, Rohit, Arya and Rhea are asked to have a Group Discussion on “Traffic Menace in Pune”. Write the transcript of the discussion in a dialogue form. 5
- B) You are attending an interview for the post of an Executive Manager in “Global Netizens Company”. Write down 5 questions you could be asked by the interviewer along with their possible responses. 5
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- A) Write a paragraph on “College Fests”. 5
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- 1) Thesauruses come in two-easy-to-use forms, the dictionary form and index form.
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P.T.O.



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

A) Write a summary note of the passage given below. **5**

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- 1) In japan, many people were hit by Tsunami.
- 2) How lucky he is
- 3) Alisha seems happy today she is jumping and dancing.
- 4) He is a tall big-built man.
- 5) Why does this always happen to me.

C) Write a description of your neighbour conveying his characteristic features and moods. **5**

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

A) Prepare 5 slides of about 20 words each for power point presentation that you would make for a seminar on “Communication Skills”. **5**

B) You are the Sports Director of your college. Write an e-mail to gamesparadise @ yahoo.com giving them the order of sports equipments required for your college Gymkhana. **5**

C) Write a note on the use of audio-visual aids in communication and presentation. **5**



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T.Y.B.Sc. (Semester – III) Examination, 2012
Paper – II : COMPUTER SCIENCE (2008 Pattern)
CS-332 : Theoretical Computer Science and Compiler Construction – I

Time : 2 Hours

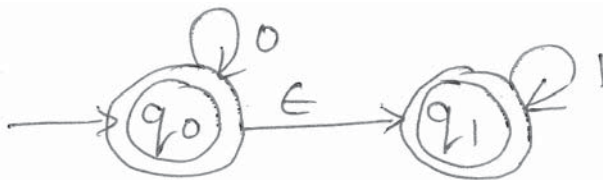
Max. Marks : 40

- Instructions :**
- 1) Black figures to the **right** indicate **full** marks.
 - 2) **All** questions carry **equal** marks.
 - 3) Assume suitable data, **if necessary**.
 - 4) **All** questions are **compulsory**.

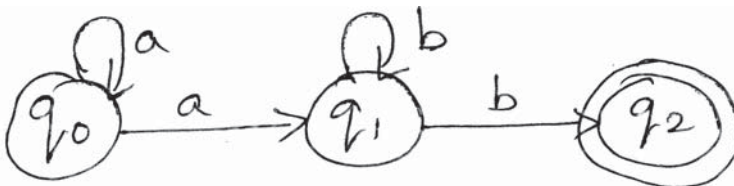
1. Attempt **all** of the following :

(1×10=10)

- a) State any two properties of a relation.
- b) Find ϵ -closure of states q_0 and q_1 for the following :



c) Describe the language accepted by the following N.F.A.

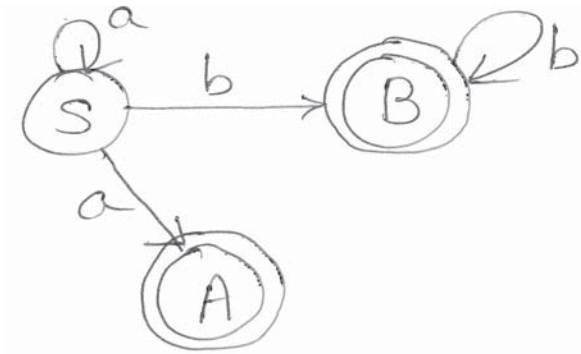


- d) List the elements of the language described by $L = (0+1)^*0$.
- e) Find the Regular Expression for the language containing exactly 2b's over $\Sigma = \{a, b\}$.
- f) Prove that $L^*L^* = L^*$ with the help of suitable example.

P.T.O.



g) Construct Regular Grammar, G, for following automaton.



h) State what is nullable symbol ?

i) What does the following transition of PDA mean ?

$$(q_j, A) \in \delta(q_i, a, B)$$

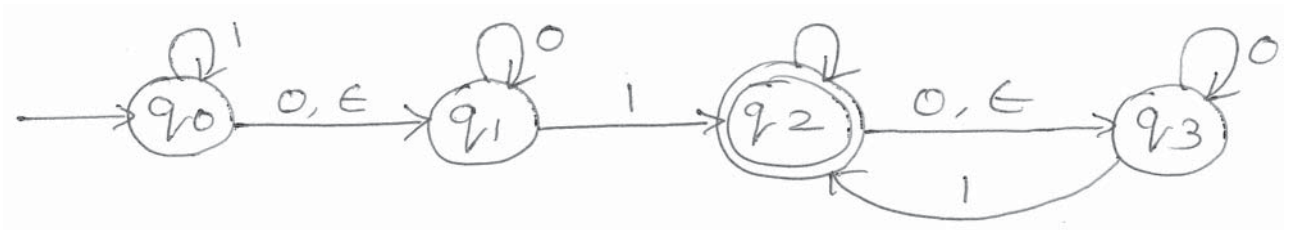
j) State which machines are used for type 1 and type 2 grammar ?

2. Attempt **any two** :

(2×5=10)

a) Construct DFA for a language over {a, b} which accepts all strings that contain substring bb or do not contain the substring aa.

b) Construct DFA equivalent to given ϵ -NFA.



c) Construct NFA with ϵ -transitions for the following regular expression.

$$(a+b)^*abb^*$$



3. Attempt **any two** : **(2×5=10)**

a) Construct the equivalent grammar by eliminating useless and non-reachable symbols.

G : $S \rightarrow aA|BD$
 $A \rightarrow aA|aAB|aD$
 $B \rightarrow aB|aC|BF$
 $C \rightarrow Bb|aAC|E$
 $D \rightarrow bD|bC|b$
 $E \rightarrow aB|bC$
 $F \rightarrow aF|aG|a$
 $G \rightarrow a|b$

b) Prove with suitable example DPDA & NPDA are not equivalent.

c) Convert the following grammar to CNF

G : $S \rightarrow A|C$
 $A \rightarrow aA|a|B$
 $B \rightarrow bB|b$
 $C \rightarrow cC|c|B.$

4. Attempt **any two** [A or B] : **(2×5=10)**

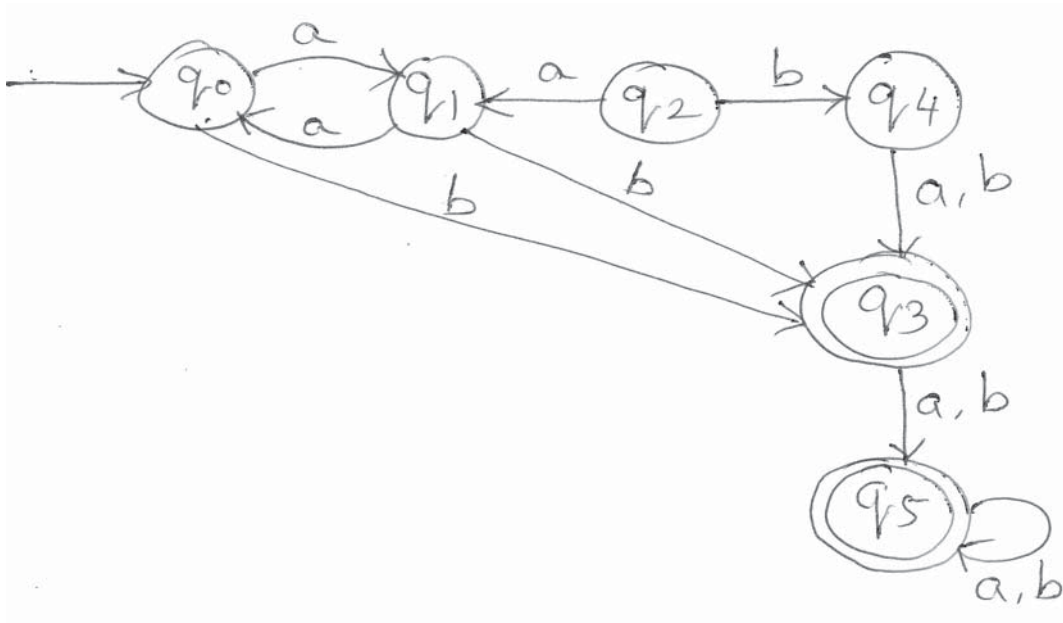
A) a) Convert the following grammar to GNF

$S \rightarrow BB$
 $A \rightarrow AA|a$
 $B \rightarrow AA|BA|b$

b) Explain iterative and composite Turing machines.



c) Minimize the following DFA



OR

4. Attempt **any two** : **(2×5=10)**

- B) a) Construct a mealy machine to replace 110 by 101.
- b) Construct a Turing machine with input alphabet {a, b, c} that accepts strings in which the first C is preceded by the substring aaa.
- c) i) Show that the class of regular languages is closed under intersection. **2**
- ii) Show that CFL's are closed under union. **3**
