

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 4

**P546**

**[5523]-1**

**F.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-101: Problem Solving using Computer & 'C' Programming**

**(2013 Pattern) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following:

**[10×1=10]**

- a) What is machine language?
- b) Define operator.
- c) Give the use of rewind ( ) function.
- d) Give the difference between break and continue statement.
- e) What is formal parameter?
- f) While passing array to a function, address of first element of array is passed. State true or false.
- g) What is dynamic memory allocation?
- h) Which function is used to join two strings? Give syntax.
- i) Give the difference between structure and union.
- j) Which function is used to move file pointer?

**Q2)** Attempt any four of the following:

**[4×5=20]**

- a) Explain for loop with suitable example.
- b) Give syntax and use of following functions:

**P.T.O.**

- i) strlen
  - ii) strcat
  - iii) strcmp
  - iv) strcpy
  - v) strrev
- c) Define array. Explain row major and column major order of matrix representation.
  - d) Define file. Explain any four file functions.
  - e) Explain malloc and calloc functions with example.

**Q3)** Attempt any four of the following:

**[4×5=20]**

- a) Write algorithm and draw flowchart to find out factorial of a number.
- b) What is the output of following C code? Justify.

```
int main ( )
{
    static char name [] = "programming";
    char *s ;
    s = & name [6] - 4;
    while (*s)
        printf ("%c", * s ++);
}
```

- c) What is the output of following C code? Justify.

```
# define Test (x) (x * x)
int main ( )
{
    int a, b = 3;
    a = Test (b + 3);
    printf ("% d - % d", a, b);
}
```

- d) What is the output of following C code? Justify.

```
struct employee
{
    char ename [20];
    int empno;
} el, * ptr, e[20];
int main ( )
{
    printf ("\n%d", sizeof (el));
    printf ("\n%d", sizeof (ptr));
    printf ("\n%d", sizeof (e));
}
```

- e) What is the output of following C code? Justify.

```
int main ( )
{
    int a =5, b = 10, c = 7;
    predict ( a, & b, c);
    printf ("% d - % d- % d", a, b, c);
}
void predict (int p, int *q, int r)
{
    p = 50;
    *q = *q * 10;
    r = 77;
}
```

**Q4)** Attempt any four of the following:

**[4×5=20]**

- Write a C program to accept a number and print its reverse.
- Write a C program to accept  $m \times n$  matrix and print sum of all elements of a matrix.
- Write a C program to read a file and display alternate characters from a file.

- d) Write a C program to declare book structure (bookno, bookname, author). Accept details of n books and display books of particular author.
- e) Write a C program to print following pattern for n lines.

```
1
2  3
4  5  6
7  8  9  10
```

**Q5)** Attempt any two of the following:

**[2×5=10]**

- a) Explain different types of operators available in C.
- b) Explain the structure of C program.
- c) Give syntax and use of following functions:
- i) getchar
  - ii) putchar
  - iii) puts
  - iv) printf
  - v) scanf

EEE

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

**P554**

**[5523]-101**

**S.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-211 : Data Structures Using 'C'**

**(2013 Pattern) (Paper - I) (Semester - I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following :

**[10 × 1 = 10]**

- a) Define Doubly Ended Queue.
- b) State the Principle on which stack works.
- c) State any two limitations of an Array.
- d) Which notation is used to denote lower bound?
- e) Define Balance Factor.
- f) Define the term Right skewed binary tree.
- g) What are advantages of ADT?
- h) What is critical path?
- i) Explain node structure of SLL.
- j) The indegree of the root node of a tree is always zero. Justify (T/F).

**Q2)** Attempt any two of the following :

**[2 × 5 = 10]**

- a) Write a 'C' Function to add and delete element from a linear queue (Dynamic implementation).
- b) Write a Recursive 'C' function to count total nodes in a BST.
- c) Write a 'C' function to insert and delete an element at particular position in SLL.

**P.T.O.**

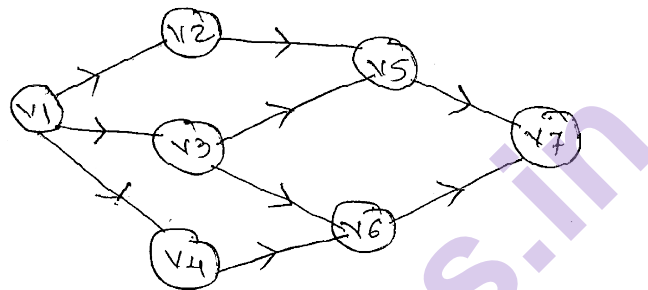
**Q3)** Attempt any two of the following :

[2 × 5 = 10]

- Construct the AVL Tree for the following data  
Chaitra, Magh, Vaishakh, Kartik, Falgun, Aashadh.
- Convert the infix expression  
 $A * B \$ C + D * E / F$  into postfix expression. Assume \$ for exponentiation and has highest priority.
- Show all the steps of sorting the following data using quick sort.  
26, 35, 24, 31, 11, 27, 19.

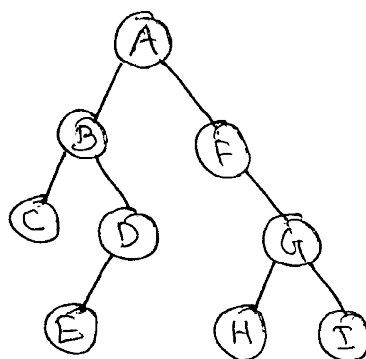
**Q4)** Attempt either A or B :

- A) a) Consider the following graph.



Write :

- Adjacency Matrix.
  - Adjacency List.
  - DFS and BFS (Start vertex  $V_1$ ). [4]
- b) Write the steps for creating BST for the following data [3]  
22, 13, 4, 6, 25, 23, 20, 18, 7, 27.
- c) What are the different ways of representing 2D arrays in memory? Give the formulae for address calculation. Explain with example. [3]
- B) a) Define the following terms :
- Data structure.
  - Topological sort.
  - AOV network.
  - Heap Tree. [4]
- b) Traverse the following binary Tree using preorder, postorder, inorder. [3]



c) Give the output of the following code.

```
int i = 1, x, y
init stack ();
while (i <= 5)
{
    Push (i * 5);
    i = i + 1;
}
x = POP ();
x = POP ();
Push (i * 5);
y = POP ();
Push (x + y)
x = POP ();
y = POP ();
Push (x + y);
while (! stack empty ())
    Print f("%d", POP ());
```

[3]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

**P555**

**[5523]-102**

**S.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-212: Relational Database Management System**

**(2013 Pattern) (Semester - I)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following:

**[10×1=10]**

- a) Define fat client.
- b) State commit point.
- c) What is system log?
- d) Define database security.
- e) Define star property.
- f) State methods for implementing timestamp.
- g) State the phases of 2PL protocol.
- h) What is transaction?
- i) What is closure of an attribute set?
- j) Write purpose and syntax of raise statement.

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Explain state transition diagram of transaction.
- b) Explain desirable properties of decomposition.
- c) Explain statistical database security with suitable example.

**P.T.O.**



**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) Explain 3-tier client-server architecture.
- b) Consider the following non-serial schedule.

$T_1$	$T_2$
Read (X);	
$X := X - N;$	
	Read (X);
	$X := X + N;$
Write (X);	
Read (Y);	
	Write (X);
$Y := Y + N,$	
Write (Y);	

Is this schedule serializable to a serial schedule  $\langle T_1, T_2 \rangle$ .

- c) Consider the following relation schema:  
Cities (City, State)  
Warehouses (wid, wname, location)  
Cities and warehouses are related with one to many relationship.  
Write a cursor to accept a city from the user and list all warehouses in that city.

**Q4)** Attempt either (A or B):

- A) a) Following are log entries at the time of system crash:  
[Start - transaction,  $T_1$ ]  
[Start - transaction,  $T_2$ ]  
[Read - item,  $T_1$ , A]  
[Write - item,  $T_2$ , B, 25, 50]  
[Start - transaction,  $T_3$ ]  
[Commit - transaction,  $T_2$ ]

[Write - item, T<sub>1</sub>, C, 100, 115]

[Commit + - transaction, T<sub>1</sub>]

[Write - item, T<sub>3</sub>, D, 50, 60]

[Read - item, T<sub>3</sub>, E]

[Write - item, T<sub>4</sub>, D, 60, 75]

[Commit - transaction, T<sub>4</sub>]

[Abort - transaction, T<sub>3</sub>] ← System crash

If immediate update recovery method is used, what will be the recovery procedure? [5]

b) Discuss different types of transaction failures. [3]

c) What is cursor? explain types of cursor. [2]

OR

B) a) Explain lost update problem and incorrect summary problem with suitable example. [5]

b) Explain database security with the help of DBA. [3]

c) What is the purpose of SELECT INTO clause? Write it's syntax. [2]

EEE

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

**P556**

**[5523]-103**

**S.Y. B.Sc.**

**COMPUTER SCIENCE**

**MATHEMATICS**

**MTC - 211 : Applied Algebra**

**(Paper -I) (2013 Pattern) (Semester - I)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt any five of the following.

**[10]**

- a) Define a subspace of a vector space. Give one example of a subspace of a vector space  $\mathbb{R}^2$ .
- b) Show that  $\mathbb{Z}_2 \times \mathbb{Z}_2$  is an abelian group with respect to coordinatewise vector addition as a binary operation.
- c) Find all eigen values of the matrix  $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$ .
- d) Show that  $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$  defined as  $T(x, y, z) = (1, 1, 1)$  is not a linear transformation.
- e) State true or false and justify the answer.

The matrix  $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$  is positive definite.

- f) Show that the set  $S = \{(1, -2), (-5, 10)\}$  is linearly dependant in  $\mathbb{R}^2$ .

**P.T.O.**

- g) If  $e_H : B^2 \rightarrow B^5$  is the encoding function defined by parity check matrix H as

$$H = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \text{ then find } e_H(10) \text{ and } e_H(11).$$

**Q2)** Attempt any two of the following.

**[10]**

- a) Find the basis for the null space of the following matrix, where

$$A = \begin{bmatrix} 1 & 4 & 5 & 6 & 9 \\ 3 & -2 & 1 & 4 & -1 \\ -1 & 0 & -1 & -2 & -1 \\ 2 & 3 & 5 & 7 & 8 \end{bmatrix}$$

- b) Prove the following:

A set S of two or more vectors is linearly dependent iff at least one of the vectors is expressible as a linear combination of the other vectors of S.

- c) Let T be a linear transformation defined by the matrix A. Find rank (T) and nullity (T).

$$A = \begin{bmatrix} 2 & 1 & 3 & 3 \\ 1 & 0 & 1 & 3 \\ 2 & 1 & 3 & 4 \end{bmatrix}$$

**Q3)** Attempt any two of the following.

**[10]**

- a) Show that the polynomial  $P = 2 - x^3 \in \mathbb{P}[x]$  is a linear combination of the polynomials  $P_1 = 1+x$ ,  $P_2 = x^3$ ,  $P_3 = 1-x$ .
- b) If the eigen values of the matrix A are 3, -1, -1 then find the eigen vectors

of the basis of eigen space where  $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$

- c) If  $T : V \rightarrow W$  is a linear transformation then prove that  $\ker(T)$  is a subspace of  $V$ .

**Q4)** Attempt any one of the following.

**[10]**

- a) Find the matrix  $P$  that diagonalizes the following matrix  $A$  and determine the matrix  $P^{-1}AP$ .

$$\text{Where } A = \begin{bmatrix} 2 & -1 & -1 \\ -1 & 2 & -1 \\ -1 & -1 & 2 \end{bmatrix}$$

- b) i) Determine whether the vector  $B = \begin{bmatrix} 5 \\ 1 \\ -1 \end{bmatrix}$  is in the column space of  $A$  and if so, express  $B$  as a linear combination of the column vectors of  $A$ .

$$\text{Given matrix } A = \begin{bmatrix} 1 & -1 & 1 \\ 9 & 3 & 1 \\ 1 & 1 & 1 \end{bmatrix}.$$

- ii) Find the minimum and maximum values of the quadratic form subject to the constraint  $x^2 + y^2 = 1$  and determine the values of  $x$  and  $y$  at which minimum value occurs,

$$\text{Where } Q = 5x^2 + 2y^2 - xy.$$



Total No. of Questions : 4]

SEAT No. :

**P557**

[Total No. of Pages : 2

**[5523]-104**

**S.Y. B.Sc. (Computer Science)**

**MATHEMATICS**

**MTC-212: Numerical Analysis**

**(2013 Pattern) (Paper - II) (Semester - I)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt any five of the following:

**[5×2=10]**

- a) Find relative error of the number  $\frac{1}{3}$  whose approximate value is 0.3333.
- b) Show that  $\delta = E^{\frac{1}{2}} - E^{-\frac{1}{2}}$ .
- c) Show that a root of the equation  $x \cdot \sin x + \cos x = 0$  lies between 2 and 3.
- d) Write Bessel's interpolation formula.
- e) Write Euler-Maclaurin's formula for numerical integration.
- f) Use Euler's method to find  $y$  at  $x = 0.2$ . Given that  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$ , take  $h = 0.2$ .
- g) Estimate missing term in the following table.

$x$	0	1	2	3
$y$	0	1	-	81

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Derive Newton-Gregory formula for forward interpolation.
- b) Find a real root of the equation  $x^3 - 5x + 3 = 0$  that lies between 0 and 1 by Newton-Rapnson method correct upto 3 decimal places (Take  $x_0 = 0.5$ .

**P.T.O.**

- c) Find population for the year 1936 by applying Gauss backward interpolation formula using the following data.

Year	1901	1911	1921	1931	1941	1951
Population (in thousand)	12	15	20	27	39	52

**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) Derive the formula for Euler's method and hence write Euler's modified formula.
- b) From the following table, find  $f(x)$  as a polynomial in  $x$  by using Lagrange's interpolation formula.

$x$	0	1	5
$f(x)$	8	68	123

- c) Evaluate  $\int_0^4 \sqrt{x} dx$  by Trapezoidal rule using the data.

$x$	0	1	2	3	4
$f(x)$	0	1	1.41	1.73	2

**Q4)** Attempt any one of the following:

**[1×10=10]**

- a) Use the Runge-Kutta fourth order method to find  $y$  at  $x = 0.2$ .

Given that  $\frac{dy}{dx} = y - x$ ,  $y(0) = 2$ , Take  $h = 0.1$

- b) i) Find value of  $y$  at  $x = 5$  by Newton's divided difference formula, using the data.

$x$	1	3	4	8	10
$y$	8	15	19	32	40

- ii) Evaluate  $\int_0^1 \frac{1}{1+x} dx$  with  $h = \frac{1}{6}$  by Simpson's  $\frac{3}{8}$  rule.

*EEE*  
2

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P558**

**[5523]-105**

**S.Y. B.Sc**

**COMPUTER SCIENCE**

**Electronics**

**ELC-211 : Digital System Hardware**

**(Semester-I) (2013 Pattern) (Paper-I)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 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 is allowed.*

**Q1)** Answer the following in one or two sentences each.

**[10×1=10]**

- a) Convert  $(11110)_2$  gray code into its equivalent binary number?
- b) Define state table.
- c) Give any two specifications of Rs-232?
- d) Define the term polling.
- e) List general purpose registers of pentium?
- f) If CS = 106AH and IP = 0200H, calculate physical address for 8086 microprocessor?
- g) What is the function instruction register?
- h) What do you mean by Associative memory?
- i) Write disadvantage of direct mapping technique of cache memory.
- j) Define memory access time.

**P.T.O.**



**Q2)** Attempt any two of the following. **[2×5=10]**

- a) Design 3-bit random sequence generator for given sequence 2,3,5,6,7,2,....
- b) Obtain number of chips required for memory size of  $1k \times 16$  using  $1k \times 4$  memory chips.
- c) Explain data transfer using DMA?

**Q3)** Attempt any two of the following. **[2×5=10]**

- a) Draw the logic diagram of Decimal to BCD encoder and explain its working?
- b) Explain 3-level memory hierarchy?
- c) What is stack? Explain register stack organization?

**Q4)** Attempt any one of the following. **[1×10=10]**

- a)
  - i) With help of suitable diagram explain the daisy chain priority interrupt?
  - ii) Explain segmentation technique of virtual memory.

OR

- b)
  - i) Differentiate between Von-Neumann and Harvard architecture? **[5]**
  - ii)
    - 1) Draw the logic diagram of half subtracter and write its truth table? **[3]**
    - 2) If  $h = 0.6$ ,  $t_c = 1 \mu\text{sec}$ ,  $T_m = 100 \mu\text{sec}$ , calculate the average memory access time? **[2]**



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

**P559**

**[5523]-106**

**S.Y. B.Sc.**

**COMPUTER SCIENCE**

**Electronics - II**

**ELC - 212 : Analog Systems**

**(2013 Pattern) (Semester - I) (Paper - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Answer the following questions in one or two sentences only. **[10×1=10]**

- a) List any two applications of ADC.
- b) What is cutoff frequency of the filter circuit?
- c) State the operating principle of LVDT.
- d) Which sensor can be used in Intruder Detector System?
- e) State any two applications of a Tilt Sensor.
- f) If  $R_1$  is the input resistance &  $R_2$  is the feedback resistance, what will be the gain of an inverting amplifier?
- g) What do you mean by passive transducers?
- h) State the types of Infrared Sensors.
- i) Draw the Frequency response of an ideal Low pass filter.
- j) What is the role of Data Converters?

**Q2)** Attempt any two of the following: **[2×5=10]**

- a) Using neat diagram explain the working principle of LDR and list any two applications.
- b) Explain Instrumentation amplifier using three Op-Amps with neat diagram.
- c) Define the following parameters with reference to ADC.
  - i) Resolution
  - ii) Linearity
  - iii) Conversion time
  - iv) Quantization error
  - v) Accuracy

**P.T.O.**

**Q3)** Attempt any Two of the following.

**[2×5=10]**

- a) Explain with neat diagram working principle of PIR sensor.
- b) Explain LM35 temperature sensor with neat diagram.
- c) Explain with neat diagram the working of a Balanced Wheatstone's Bridge.

**Q4)** Attempt any one of the following.

**[1×10=10]**

- a)
  - i) Explain with neat diagram Op-Amp based voltage to frequency converter.
  - ii) Explain 2 Bit Flash type of ADC with neat diagram.

OR

- b)
  - i) Draw and explain water level indicator system.
  - b) Explain Analog Electronic System with neat diagram.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

**P560**

**[5523] - 107**

**S. Y. B. Sc. (Computer Science)**

**ENGLISH**

**Technical English**

**(2013 Pattern) (Semester - I)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1) A)** Attempt any one of the following in about 100 words. **[5]**

- a) Explain the theme of the lesson "The sun, the planets and the stars"
- b) Write a short note on 'Sun' with reference to the lesson "The sun, the planets and the stars".

**B)** Attempt any one of the following in about 100 words. **[5]**

- a) Explain why Haldane thinks that the scientific point of view has definite advantages for civilization.
- b) Comment briefly on the theme of the lesson "The Scientific Point of View".

**Q2) A)** Attempt any one of the following in about 100 words. **[5]**

- a) Do you agree with the statement that 'Purdah' is a poem about loss of self identity. Give reasons to support your answer.
- b) What effects does a child experience when it shifts from the 'Television world' to a real world?

**P.T.O.**

B) Attempt any one of the following in about 100 words. [5]

- a) Is Television a good baby sitter of support your answer with examples.
- b) Comment on the theme of the poem “A Psalm of Life”

**Q3)** A) Combine words from (A) & (B) to form a compound word. [5]

- | A       | B           |
|---------|-------------|
| a) Moon | i) Minded   |
| b) Open | ii) Board   |
| c) Mile | iii) Castle |
| d) Key  | iv) Stone   |
| e) Sand | v) Light    |

B) Choose the right combination from the following. [5]

- a) renew a contract | re - sign a contract
- b) press an icon | click on an icon
- c) glare at | glare to wards
- d) dress code | dress uniform
- e) equitable rights | equal rights

**Q4) A)** Fill in the blanks with the tense form of the verbs as given in the bracket [5]

- a) I——(write) the poem  
(Past Perfect Tense)
- b) Raghav's wife —— (teach) sanskrit in the school  
(Simple Present Tense)
- c) The Zoo——(close)by the time we get there.  
(Future Perfect Tense)
- d) He ——(write) many poems  
(Present Perfect Tense)
- e) They ——(talle) to each other  
(Present Progressive Tense)

**B) Do as Directed** [5]

- a) The man who is wearing a white kurta speaks fluent Marathi  
(change into simple sentence)
- b) Sitting under a shady tree, the family enjoyed their picnic lunch  
(change into a compound sentence)
- c) Rekha has returned from varanasi  
(change into a Interrogative sentence)
- d) The Reporter was briefed by the editor  
(change into an active voice)
- e) The teacher said, "shut the door"  
(change into indirect speech)



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 4

**P547**

**[5523]-2**

**F.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-102 : File Organization and Fundamentals of Databases**

**(2013 Pattern) (Paper - II)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*

**Q1)** Answer all of the following:

**[10×1=10]**

- a) What is a physical file?
- b) Define Database Management System.
- c) Explain the term tuple with an example.
- d) What is a candidate key?
- e) What do you mean by natural join operation?
- f) Explain the use of aggregate function.
- g) What is partial dependancy?
- h) Define second normal form.
- i) What is difference between Char & Varchar?
- j) Who are Naive users?

**Q2)** Answer any four of the following :

**[4×5=20]**

- a) What is attribute? Explain different types of attributes.
- b) Write a short note on sorted or sequential file organization.
- c) Explain overall DBMS structure with neat diagram.
- d) What is referential integrity constraint? Explain it in brief.
- e) Consider the relation R(A, B, C, D, G, H, I) and the set of F.D.S. defined on R as: {A→B, A→C, CG→H, CG→I, B→H} Compute the closure of F i.e. F<sup>+</sup>.

**P.T.O.**

**Q3)** Answer any four of the following :

**[4×5=20]**

- a) What are desirable properties of decomposition? Explain it in brief.
- b) Explain union and division operation in relational algebra.
- c) What is specialization? Explain it with an example.
- d) Write a short note on data abstraction.
- e) What are the different functions performed by DBA?

**Q4) A)** Answer any three of the following :

**[3×5=15]**

- a) Consider the following relations:

Doctor (Dno, Dname, Daddress, city)

Patient (Pno, Pname, Paddress, disease)

Doctor and Patient are related with many to many relationship. Create a relational database in 3NF and solve the following queries in SQL.

- i) Find the number of patients visited by 'Dr. Rahane'.
- ii) Find the name of doctor starting with 'A'.
- iii) Delete all the patients record suffering from 'viral fever'.

- b) Consider the following relations :

Parts (Partno, Pname, Quantity, Price)

Supplier (Sno, Sname, City)

Parts & Supplier are related with many to many relationship. Create a relational database in 3NF and solve the following queries in SQL.

- i) List the names of suppliers supplying partname 'Wheel'.
- ii) Find the names of parts in descending order of quantity.
- iii) List the names of supplier supplying partno 5 with price < 5000.



c) Consider the following relations :

Movie (Mno, Mname, Budget)

Actor (Ano, Aname, Role)

Actor and Movie are related with one to many relationship. Create a relational database in 3N.F. and solve the following queries in SQL.

- i) List the name of movie in which 'Amir' has acted.
- ii) Count the number of actor in movie 'Padmavat'.
- iii) List the budgetwise movie.

d) Consider the following relations :

employee (eno, ename, salary, designation)

Project (Pno, Pname, location)

employee and project are related with many to one relationship. Create a relational database in 3N.F. and solve the following queries in SQL.

- i) List all the employees working on the project 'Web Designing'.
- ii) List all the project having more than 20 employees.
- iii) Give the names of all employees working on the 'CAD/CAM' project.

B) Attempt any one of the following :

[1×5=5]

a) Consider the following relations :

Food\_Product (Food\_id, Food\_name, Weight)

Ingredient (In\_id, Name, Quantity)

F\_Ing (Food\_id, In\_id, Quantity)

Solve the following queries in relational algebra.

- i) Give all the ingredient of 'Mango Barfi'.
- ii) List the name of ingredient used both in 'Coconut Barfi' and in 'Boondi-Laddu'.
- iii) List the name of food product of weight more than 2 kg.
- iv) List the name of food product who used ingredient as 'Sugar'.
- v) List the name of ingredient used either in 'Choco-cake' or in 'Biscuits'.

b) Consider the following relations :

Dept (Dno, Dname, location)

employee (eno, ename, designation, dno, Pno)

Project (Pno, Pname, Status)

Solve the following queries in relational algebra.

- i) List all employees of 'Inventory' department of 'Pune' location.
- ii) Give the name of employees who are working on 'Blood Bank' Project.
- iii) Give the name of manager from 'Purchase' department.
- iv) Give all the employees working under 'complete' projects.
- v) Find the name of employee having designation as 'Clerk'.

**Q5) a)** Now a days there are many multiplex theaters opened in Nagpur city. These multiplex theaters can show 3 to 5 movies at a time. Theaters self decide which movie has to be shown to people for longer time. Movie is of two types : universal and adult's. Adult's movie can not allow to age below 18 persons. Many theaters have AC and doubly digital sound quality system. The ticket of movie is along with taxes or tax-free. Based on above information :

- i) Design an E-R diagram. (Assume suitable data if necessary)
- ii) Convert the E-R diagram into relational database in 3 N.F. [7]

b) Explain projection operation in relational algebra with an example. [3]

OR

Differentiate between strong and weak entity with suitable example. [3]



Total No. of Questions :4]

SEAT No. :

**P561**

**[5523]-201**

[Total No. of Pages : 3

**S.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-221 : Object Oriented Concept Using C++  
(2013 Pattern) (Semester - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following questions.

**[10×1=10]**

- a) Define class.
- b) Write a syntax of new operator.
- c) How many explicit arguments are required if binary operator is overloaded using member function?
- d) Define templates.
- e) What is the use of `getline ( )` and `write ( )` function?
- f) What is the meaning of `catch (...)` statement?
- g) Give an explicit call for the following constructor integer `int 1 (0, 100);`
- h) Write a syntax of pure virtual function.
- i) Differentiate between `ios :: ate` and `ios :: app` file opening modes.
- j) Write any 2 rules for operator overloading.

**Q2)** Attempt any two of the following questions.

**[2×5=10]**

- a) Write a C++ program which accepts student information (name, age and year). The program should throw an exception for the following situations.
  - age is not between 10 and 25.
  - year is not “FY”, “SY” and “T.Y”.
- b) Write a C++ program to overload arithmetic operator (+, −, \*, /)
- c) Write a C++ program that reads a text file and search the file contents (eg – city name).

**P.T.O.**

**Q3)** Attempt any two of the following.

**[2×5=10]**

- a) Explain the terms with example.
  - i) Pass by reference
  - ii) Return by reference
- b) Explain overloading of constructor in detail.
- c) Define Polymorphism. List and explain types of polymorphism.

**Q4)** Attempt any one of the following (A or B).

- a)
  - i) Explain class template with multiple parameters with example. **[4]**
  - ii) List the properties of static member functions. **[3]**
  - iii) Identify the output of the following code, segment and Justify. (Assume there are no syntax error) class base. **[3]**

```
{
    Public:
        Virtual void base func ( ) { Cout <<“Show Base”;}
};
Class derived
{
    Public:
        Void basefunc() { Cout <<“Show derived”;}
};
Void f1 (base * baseobj)
    {base obj→basefunc ( ); }
int main ( )
{
    base baseobject;
    f1 (& baseobject);
    derived deriobject;
    f1 (& deriobject);
    return 0;
}
```

OR

b) i) Explain the use of the following with syntax and example. [4]

- 1) try
- 2) throw
- 3) Catch

ii) Explain reference variable with syntax and give suitable example.[3]

iii) Identify the error in the following program: [3]

```
# include <iostream.h>
```

```
Class demo
```

```
{  
    int num;  
    Public:  
        Demo ( )  
        {  
            num = 0;}  
        Demo operator ++ ( )  
        {  
            num ++;  
            return demo (num);  
        }  
};
```

```
Void main ( )
```

```
{  
    demo obj;  
    obj ++;  
}
```



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

**P 562**

**[5523]-202**

**S.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS - 222 : Software Engineering  
(2013 Pattern) (Semester-II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following:

**[10×1=10]**

- a) What is Elicitation?
- b) State the purpose of testing.
- c) “System is not goal seeking” Justify.
- d) List the benefit of MIS.
- e) List any two key XP activities.
- f) What is meant by structured Analysis?
- g) What is negotiation?
- h) What is meant by deployment?
- i) What is pair-programming?
- j) Define Risk Analysis.

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Explain phases of ASD Life cycle.
- b) Explain any five component of Data Dictionary?
- c) State difference between structured and unstructured interview.

**P.T.O.**

**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) Explain V-model.
- b) Write note on system maintenance.
- c) Explain open and closed system.

**Q4)** Attempt the following:

**[2×5=10]**

- a) Explain any five principles to active agility.

OR

What is prototyping? Explain the steps of prototyping?

- b) Draw context level, first level DFD for payroll system.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

**P563**

**[5523]-203**

**S.Y. B.Sc.**

**COMPUTER SCIENCE**

**MATHEMATICS**

**MTC - 221 : Computational Geometry  
(Paper -I) (2013 Pattern) (Semester - II)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt any five of the following.

**[10]**

- a) If a transformation matrix  $[T] = \begin{bmatrix} 4 & 3 \\ -1 & 2 \end{bmatrix}$  is used to transform a rectangle with sides 3cm and 5cm, then find the area of the transformed figure.
- b) Write the transformation matrix for shearing in  $y$  direction proportional to  $x$  and  $z$  coordinate by 1.5 and -2 units respectively. Apply it on the point  $P[-2 \ 5 \ 7]$ .
- c) Define a foreshortening factor. Write the principal foreshortening factors for isometric projection.
- d) Write the transformation matrix for cavalier projection with the horizontal inclination angle  $\alpha = 25^\circ$ . Apply it on the point  $P[-1 \ 3 \ 1]$ .
- e) Write the equation of the Be'zier curve with control points  $B_0$ ,  $B_1$  and  $B_2$ .
- f) Determine increment factor  $\delta\theta$  to generate 7 points on the parabola  $y^2 = 20x$ , for  $10 \leq y \leq 40$  in the first quadrant.

**P.T.O.**



- g) Is the following matrix  $[T]$  a solid body transformation? Justify.

$$[T] = \begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} \\ -1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix}$$

**Q2)** Attempt any two of the following **[10]**

- a) Reflect  $\triangle ABC$  through the line  $y = -2$ , where  $A = [1 \ 3]$ ,  $B = [0 \ 5]$  and  $C = [2 \ 2]$ .
- b) Derive the transformation matrix for rotation about an arbitrary point  $(a, b)$  through an angle  $\theta$ .
- c) If two lines  $2x - y = 7$  and  $3x + y = 3$  are transformed under the transformation matrix  $[T] = \begin{bmatrix} 3 & 4 \\ -1 & 2 \end{bmatrix}$ , then find the point of intersection of transformed lines.

**Q3)** Attempt any two of the following. **[10]**

- a) Determine the angles through which the plane  $x - 2y + 2z = 0$  should be rotated so that it coincides with the  $z = 0$  plane.
- b) Find the concatenated transformation matrix for the following sequence of transformations : First reflection through  $y = 0$  plane; followed by rotation about  $z$  axis through  $90^\circ$ ; followed by perspective projection onto  $x = 0$  plane with the centre of projection at  $x_c = 5$  on  $x$  axis.
- c) Develop the transformation matrix for rotation about local  $x$  axis passing through point  $(1, 1, 0)$  through an angle  $50^\circ$ .

**Q4)** Attempt any one of the following. **[10]**

- a) i) Generate uniformly spaced 5 points on the ellipse  $\frac{x^2}{4} + \frac{y^2}{25} = 1$ .

- ii) Determine the dimetric projection if a foreshortening factor along  $z$  axis is  $\frac{2}{3}(\theta > 0, \phi < 0)$ .
- b) i) Write the parametric equation of the Be'zier curve with control points  $B_0[1\ 3]$ ,  $B_1[2\ 4]$ ,  $B_2[5\ 3]$  and  $B_3[3\ 1]$ . Hence find the points on the curve corresponding to parameter values  $t = 1$  and  $t = 0.6$ .
- ii) Derive the iterative matrix for generation of uniformly spaced  $n$  points on the circumference of circle  $x^2 + y^2 = r^2$ .



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Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 4

**P564**

**[5523]-204**

**S.Y. B.Sc. (Computer Science)**

**MATHEMATICS**

**MTC-222: Operations Research**

**(2013 Pattern) (Paper - II) (Semester - II)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt any five of the following:

**[10]**

- a) Explain operations research model.
- b) Draw the feasible region for the following constraints.

$$y - x \geq 2$$

$$y - x \leq -2$$

$$x, y \geq 0$$

- c) Determine the saddle point and optimum strategies for each player in the following game.

	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>
A <sub>1</sub>	-3	-2	0
A <sub>2</sub>	2	0	2
A <sub>3</sub>	5	-2	4

- d) Define
  - i) A stable game
  - ii) A fair game

**P.T.O.**

- e) Write the dual of the following LPP.

$$\begin{aligned} \text{Maximize} \quad & Z = 5x_1 + 12x_2 + 4x_3 \\ \text{Subject to:} \quad & x_1 + 2x_2 + x_3 \leq 10 \\ & 2x_1 - x_2 + 3x_3 = 8 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

- f) Consider the transportation problem given below. Is the given solution degenerate? Justify.

10			10
	20	20	40
10	20	20	

The values in the table denote the allocations at the respective cells.

- g) Explain the method to convert a given unbalanced assignment model to a balanced model.

**Q2)** Attempt any two of the following:

**[10]**

- a) State the dominance principle and write the rules of dominance.  
b) Solve the following LPP by simplex method.

$$\begin{aligned} \text{Max } Z = \quad & 2x_1 + 3x_2 + 7x_3 \\ \text{Subject to:} \quad & 3x_1 + 2x_2 + 4x_3 \leq 100 \\ & x_1 + 4x_2 + 2x_3 \leq 100 \\ & x_1 + x_2 + 3x_3 \leq 100 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

- c) Find on IBFS by VAM method for the following transportation problem

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
S <sub>1</sub>	3	7	6	4	5
S <sub>2</sub>	2	4	3	2	2
S <sub>3</sub>	4	3	8	5	3
	3	3	2	2	

**Q3)** Attempt any two of the following:

[10]

a) Solve the following game

		Firm B	
		I	II
Firm A	I	20	-6
	II	-8	2
	III	-4	3

b) The IBFS of a transportation problem is given below. Is the given solution optimal? If not, find the optimal solution using MODI method.

4	8	8	0
16	24	16	0
8	16	24	0

c) Solve the following assignment problem.

	A	B	C	D	E
M <sub>1</sub>	9	11	15	10	11
M <sub>2</sub>	12	9	-	10	9
M <sub>3</sub>	-	11	14	11	7
M <sub>4</sub>	14	8	12	7	8

**Q4)** Attempt any one of the following:

[10]

a) Solve the following LPP by Big-M method.

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

$$\text{Subject to: } 2x_1 + x_2 \geq 4$$

$$x_1 + 7x_2 \geq 7$$

$$x_1, x_2 \geq 0$$

- b) i) Solve the following assignment problem for maximization

	A	B	C	D
P	42	35	28	21
Q	30	25	20	15
R	30	25	20	15
S	24	20	16	12

- ii) Solve the following game graphically.

Player B

Player A  $\begin{bmatrix} 1 & 3 & -3 & 7 \\ 2 & 5 & 4 & -6 \end{bmatrix}$

EEE

Total No. of Questions : 4]

SEAT No. :

**P565**

[Total No. of Pages : 3

**[5523]-205**

**S.Y. B.Sc. (Computer Science)**

**ELECTRONICS SCIENCE**

**ELC-221: The 8051 Architecture, interfacing and Programming  
(2013 Pattern) (Semester - II) (Paper - I)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Answer the following in one or two sentences:

**[10×1=10]**

- a) What is meant by a microcontroller?
- b) Define the term: assembler directive.
- c) What is the significance of Gate bit of TMOD register?
- d) Write two applications of ARM processor.
- e) What is the maximum input voltage which can be applied to ADC 0804 if  $V_{ref}/2 = 2V$ .
- f) What is the capacity of internal ROM of 8051?
- g) What is the value of stack pointer register of 8051 on reset?
- h) Which pin of LCD is used for controlling its contrast?
- i) Which special function register of 8051 is used to keep track of priority of interrupts?
- j) Identify the addressing mode of 8051 instruction MOV A, @ R1.

**P.T.O.**

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Write 8051 c-program to rotate a stepper motor connected to port 1 in clockwise direction continuously.
- b) Explain the internal RAM organization of 8051 microcontroller.
- c) Explain the operation of following 8051 instructions.
  - i) CLR A
  - ii) ORL A, # 75 H
  - iii) LCALL 2000 H
  - iv) SETB PSW. 4
  - v) MUL AB

**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) Write an 8051 assembly language program for blinking of 8 LEDS connected to port 2.
- b) Write an 8051 C- program for generating a pulse on pin P 3.2 using timer 1 in mode 1.
- c) Explain the function of following pins of 8051 microcontroller.
  - i) RESET
  - ii) ALE
  - iii)  $\overline{\text{EA}}$
  - iv)  $\overline{\text{PSEN}}$
  - v) XTAL 1 and XTAL 2



**Q4)** Attempt any one of the following:

**[1×10=10]**

- a)
  - i) Draw a block diagram of interfacing DAC to port 1 of 8051 microcontroller. Write a C- program to generate triangular waveform.
  - ii) Draw the control word format of TCON register of 8051. Explain the significance of each bit of the register.
- b)
  - i) Write the types of interrupts of 8051. Mention the vector addresses of these interrupts.
  - ii) Which port of 8051 requires external pull up resistors? Draw a block diagram interfacing common anode SSD to port 2.

EEE

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Total No. of Questions : 4]

SEAT No. :

**P566**

[Total No. of Pages : 2

**[5523]-206**

**S.Y. B.Sc. (Computer Science)**

**ELECTRONIC SCIENCE**

**ELC-222 : Communication Principles**

**(2013 Pattern) (Paper - II) (Semester - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Answer the following in one or two lines : **[10 × 1 = 10]**

- a) Give any two examples of half duplex communication system.
- b) State the Nyquist theorem.
- c) Draw the waveform of FSK for the data (110011).
- d) How many voice channels are multiplexed in a master group?
- e) Comment on “Guard band is essential in FDMA”.
- f) For an Amplitude modulated system, maximum amplitude of envelop is 5V and minimum amplitude is 2V, Calculate modulation index.
- g) What is an active RFID tag?
- h) What do you mean by MTSO in GSM system?
- i) What is Zigbee?
- j) Draw the radiation pattern of Omnidirectional Antenna.

**Q2)** Attempt any two of the following : **[2 × 5 = 10]**

- a) Explain the working of diode modulator for AM. Draw neat diagram and waveform.
- b) State any five features of FDMA.
- c) Draw a neat block diagram of electronic communication system. Explain each block in brief.

**P.T.O.**

**Q3)** Attempt any two of the following :

**[2 × 5 = 10]**

- a) Differentiate between TDM and FDM.
- b) Explain GPRS general architecture with neat block diagram.
- c) Explain three steps involved in PCM. Give demerits of PCM.

**Q4)** Attempt any one of the following :

**[1 × 10 = 10]**

- a) i) Explain Bluetooth Protocol architecture in detail.
- ii) Define five parameters of Antenna.

OR

- b) i) Explain effect of modulation index in AM. Draw neat diagram of waveforms.
- ii) Give any five features of TDMA.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages :2

**P567**

**[5523]-207**

**S.Y. B.Sc.**

**COMPUTER SCIENCE**

**Technical English**

**(Semester-II) (2013 Pattern)**

*Time :2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1) a)** Attempt any one of the following. **[5]**

- i) Describe the character of Rosemary Fell.
- ii) How does narrator react to the changes in his photograph. Explain with the illustrations.

**b)** Attempt any one of the following **[5]**

- i) Comment on the end of the story A Cup of Tea.
- ii) Bring out the humour in the story With the Photograph.

**Q2) a)** Attempt any one of the following. **[5]**

- i) Comment on the theme of the poem Ozymandias.
- ii) Write a detailed note on the virtues that are discussed in the poem If.

**b)** Attempt any one of the following. **[5]**

- i) “For oft, when on my couch I lie In vacant or in pensive mood,  
They flash upon that inward eye Which is the bliss of solitude”  
Explain the above lines with reference to the poem Daffodils.
- ii) Comment on the title of the poem If.

**P.T.O.**

**Q3)** Attempt any two of the following. **[10]**

- a) Write a detailed note on the Do's and Dont's of Group Discussion.
- b) Frame five interview questions with their probable answers for the post of a system Analyst.
- c) Prepare a power point presentation of 5 slides on any new app to be used in mobile phone.
- d) Write a detailed note on interview techniques.

**Q4)** Attempt any two of the following. **[10]**

- a) Write a review of the film that you have watched recently.
- b) Write an essay on "impact of social Media on Youth".
- c) Develop a paragraph on "If you Dream it: you can do it".
- d) Write a newspaper report on "Tree Plantation Drive" conducted by your college.



Total No. of Questions :5]

SEAT No. :

P548

[5523]-3

[Total No. of Pages : 7

**F.Y. B.Sc. (Computer Science)**  
**MATHEMATICS - I**  
**MTC-101 : Discrete Mathematics**  
**(2013 Pattern) (Paper - I)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of single memory, non-programmable, Scientific calculator is allowed.

**Q1)** Attempt any eight of the following :

[16]

a) Let  $p$  : It is below freezing.

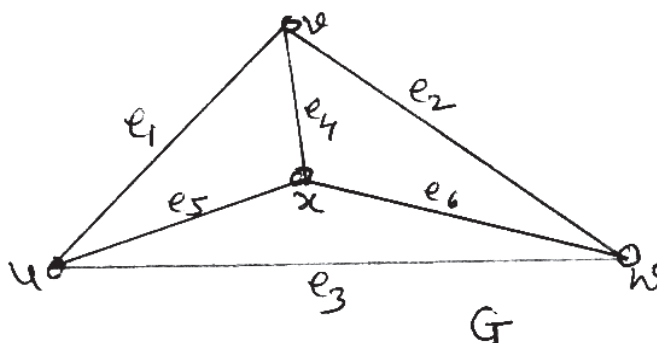
$q$  : It is snowing.

Write the following propositions using  $p, q$  and logical connectives.

- i) It is below freezing and snowing.
- ii) If it is below freezing , then it is snowing.

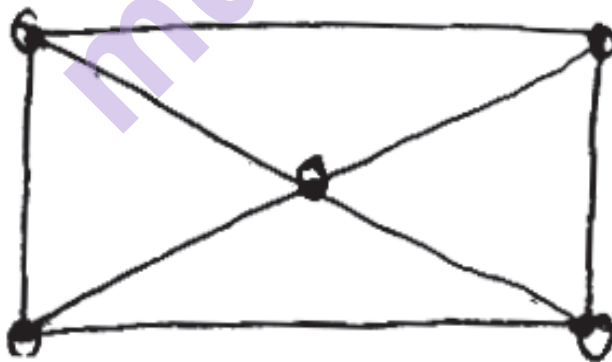
b) Solve the recurrence relation  $a_n - 4a_{n-2} = 0$

c) List any four  $u-v$  paths in the following graph G.



P.T.O.

- d) Find complement of  $C_5$ .
- e) State Idempotent and Absorption laws in a Lattice.
- f) With usual notation, prove that  $\sim(p \rightarrow q) \equiv p \wedge \sim q$ .
- g) State whether the given statement is True or False. Justify your answer.  
“There exists a binary tree of height 2 on 8 vertices.”
- h) Define :
- Balanced digraph
  - Symmetric digraph
- i) Find vertex connectivity of the following graph.



- j) Give an example of a connected graph that has Hamiltonian cycle and Eulerian trail.

**Q2)** Attempt any Four of the following :

**[16]**

- a) Test the validity of the following argument :

$$R \rightarrow P, G \rightarrow M, (P \vee M) \rightarrow S, \sim S \vdash \sim (R \vee G)$$

- b) Draw the Hasse diagram of  $D_{30}$  with divisibility as an operation, where  $D_{30}$  = set of all divisors of 30.

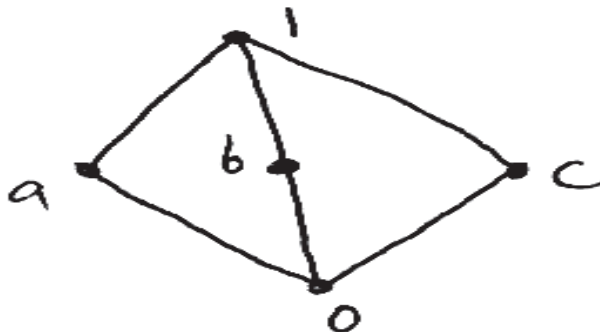
- c) How many integers between 1 and 1,000 are divisible by 2 or 3 or 5.

- d) Write the negation of given statements. Also find the truth value of each statement.

i)  $\forall x \in \mathbb{R}, x^2 > x$

ii)  $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x + y = 1$

- e) Determine if the following lattice is distributive lattice. Is it a bounded lattice?



- f) Solve the recurrence relation  $a_n = 3a_{n-1} + 4a_{n-2}$ ,  $n \geq 2$  and  $a_0 = a_1 = 1$



**Q3)** Attempt any two of the following :

[16]

- a) Find the conjunctive normal form and Disjunctive normal form of the following Boolean Expression.

$$f(x_1, x_2, x_3) = (x_1 \vee \bar{x}_2) \wedge (\bar{x}_1 \vee x_3).$$

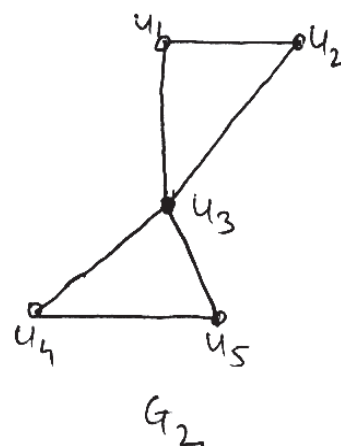
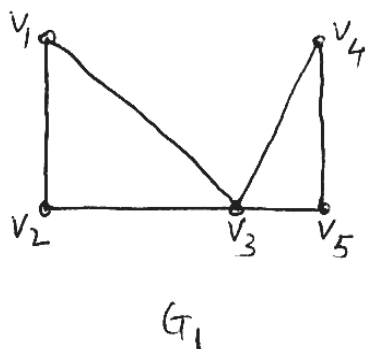
- b) The students in a hostel were asked whether they had a TV set or a computer in their rooms. The result showed that 650 students had a TV set; 150 did not have a TV set ; 175 had a computer and 50 had neither a TV set nor a computer. Find the number of students who

- i) live in a hostel.
  - ii) have both a TV set and a computer
  - iii) have only a computer
- c) Solve recurrence relation  $a_{n+2} + 2a_{n+1} + a_n = 9 \cdot 2^n$

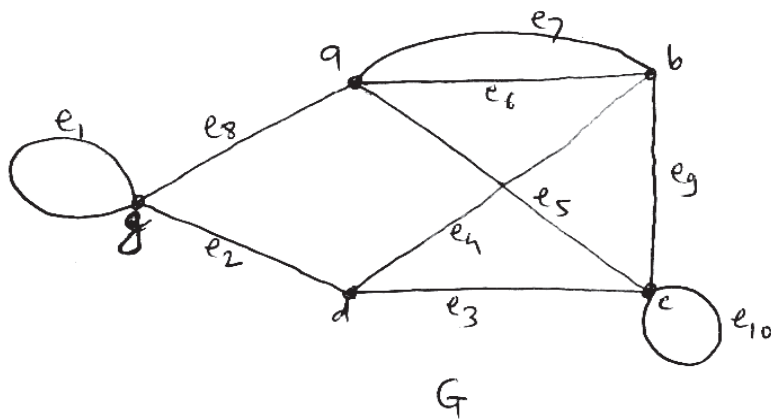
**Q4)** Attempt any Four of the following :

[16]

- a) What is the prefix form of the expression  $((x+y)^{\uparrow 2}) + ((x-4)/3)$ ?
- b) Show that the following pair of graphs are isomorphic.



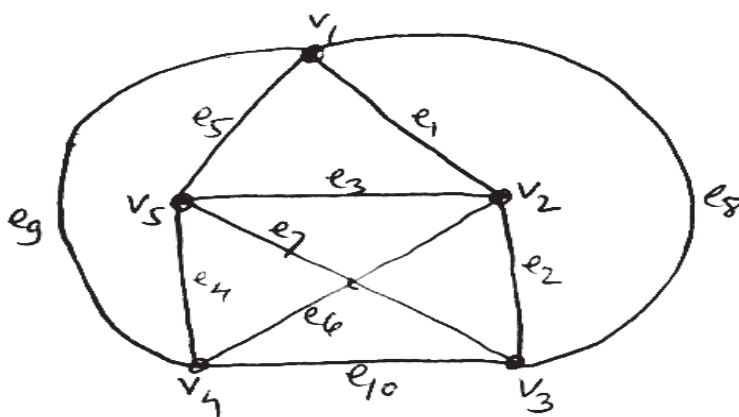
c) Find Adjacency matrix of graph G given below.



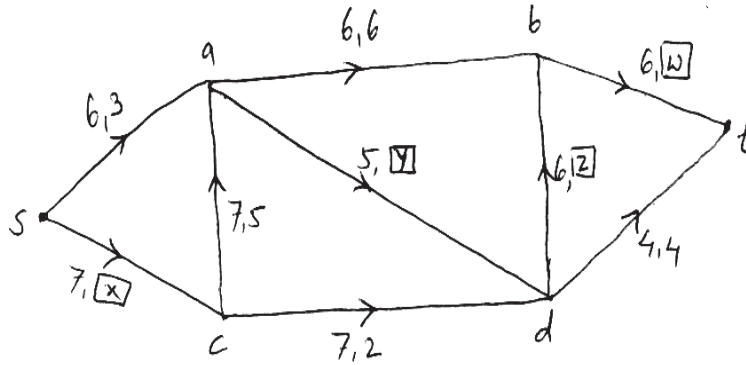
d) Define the following terms :

- i) Regular graph
- ii) Complete graph
- iii) Saturated Edge
- iv) Self complementary graph

e) Find Eulerian trail of given Eulerian graph by using Fleury's Algorithm.



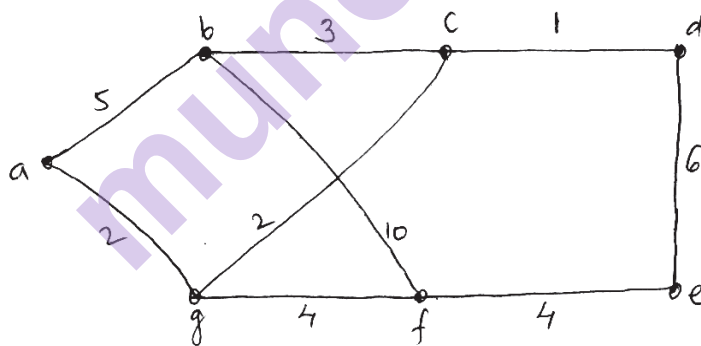
- f) In the following network, fill the blocks with suitable numbers so that second set of numbers determine a flow in the network.



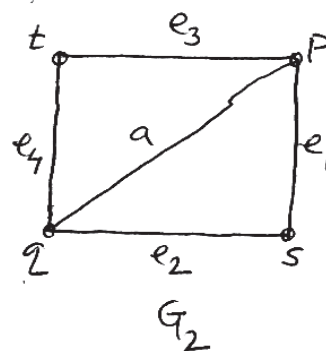
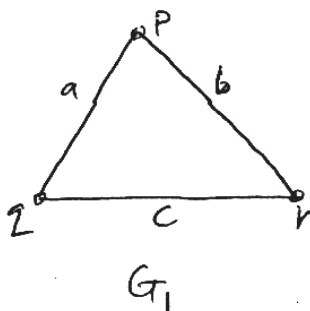
Q5) Attempt any two of the following :

[16]

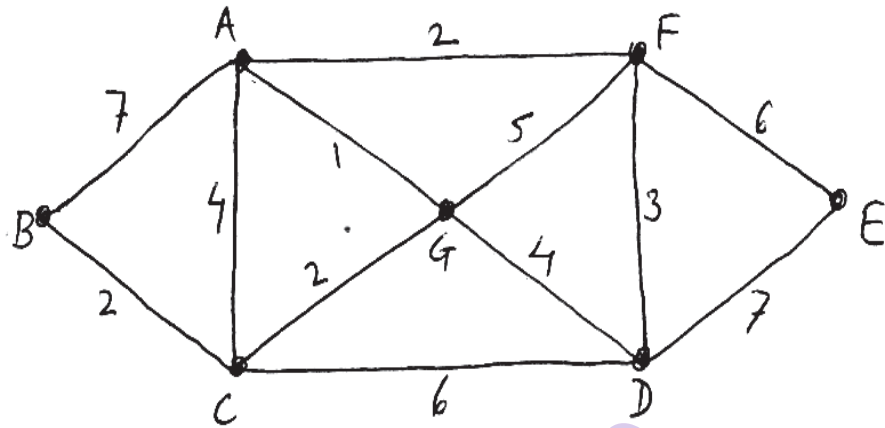
- a) Use Dijkstra's Algorithm to obtain shortest path from vertex 'a' to all the remaining vertices.



- b) i) From the following two graphs  $G_1$  and  $G_2$  find  $G_1 \cup G_2$  and  $G_1 \cap G_2$

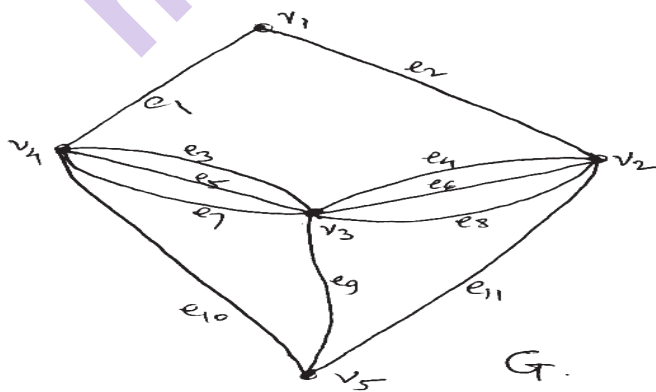


- ii) Using Kruskal's Algorithm, find the minimum weighted spanning tree in the following graph.



- c) Consider the graph  $G$  given below and answer the following.

- Draw vertex deleted subgraph  $G - v_3$ .
- Draw Edges deleted subgraph  $G - \{e_1, e_2, e_{10}, e_{11}\}$ .
- Draw Edge Induced subgraph  $G(S)$  where  $S = \{e_3, e_4, e_7, e_8\}$ .
- Draw Vertex Induced subgraph  $G(T)$  where  $T = \{v_1, v_4, v_3\}$ .



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages :3

**P568**

**[5523]-301**

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-331 : System Programming**

**(Semester-III) (2013 Pattern) (Paper-I)**

*Time :2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagram must be drawn whenever necessary.*

**Q1)** Attempt all.

**[10×1=10]**

- a) List any two examples of system software.
- b) Which editor maintains the multiple representation of text?
- c) What is the purpose of constant '200' used in START 200 statement?
- d) Explain the role of POOLTAB in assembler.
- e) Define Macro Assembler.
- f) What is the advantage of impure interpreter over pure interpreter?
- g) What is relocation?
- h) State the use of strip utility on unix.
- i) List any two advantages of distributed system.
- j) What is the purpose of command interpreter?

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Explain various components of object module with suitable example.
- b) Explain the steps in gcc compilation.

**P.T.O.**

- c) Consider the following assembly language program.

```

START 300
READ A
MOVER AREG, A
MULT AREG, = '4'
MOVEM AREG, B
LTORG
PRINT B
STOP
A DS 1
B DS 1

```

write intermediate code form using variant-I & variant-II

**Q3)** Attempt any two of the following:

**[2×5=10]**

- Explain multiprocessor system.
- What are the tasks of analysis & synthesis phase in assembly process?
- Consider the following macro.

```

MACRO
CLEARMEM &X, &N, &REG = CREG
LCL &M
&M SET 1
MOVER &REG = '0'
.MORE MOVEM &REG, &X + &M
&M SET &M + 1
AIF (&M NE &N) .MORE
MEND

```

Show the contents of following data structure.

- MNT
- MDT
- PNTAB
- KPDTAB
- SSNTAB

**Q4)** Attempt either (A) or (B)

**[1×10=10]**

- (A) a) Write a short note on P-code compiler [4]  
b) What is nested macro call? Explain any one method how to handle nested macro call. [4]  
c) State the purpose of an editor. [2]
- (B) a) How forward reference problem handle in one-pass assembler? [4]  
b) Explain the purpose of an operating system. [4]  
c) Explain any two commands of line editor. [2]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

**P569**

**[5523]-302**

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-332: Theoretical Computer Science**

**(2013 Pattern) (Semester - III) (Paper - II)**

*Time : 2 Hours]*

*[Max. Marks :40*

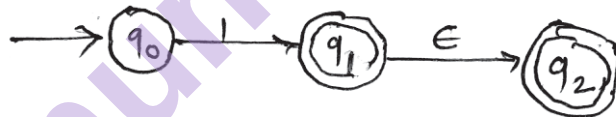
*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All question carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Attempt all of the following:

**[10×1=10]**

- a) What are the proper prefix and proper suffix of the string “Computer”?
- b) Write down the  $\epsilon$  - closure of each state from the following FA:



- c) Write smallest possible string accepted by the following regular expression.

$(11)^* (00)^* + (10+01)^*.1$

- d) Finite Automata has more than one Final states (True or False) Justify.
- e) Define context sensitive grammar.
- f) Write formal definition of DPDA.
- g) Define recursively enumerable language.
- h) State lemma 2 for converting a CFG to GNF.
- i) State two differences between NFA and DFA.
- j) Write the tuples of LBA.

**P.T.O.**



Q2) Attempt any two of the following:

[2×5=10]

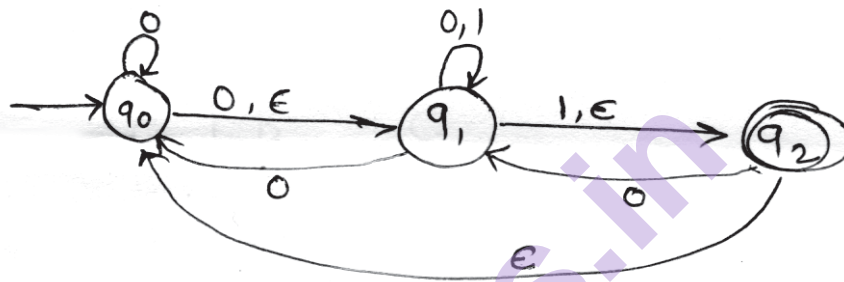
- a) Construct a DFA for a language

$L = \{x \mid x \text{ has neither "aa" nor "bb" as a substring}\}$  over  $\Sigma = \{a, b\}$ .

- b) Construct FA for regular expression:

$(0 + 1)^* 01 + (1 + 0)^* 11$

- c) Convert the following NFA with  $\epsilon$  moves to DFA.



Q3) Attempt any two of the following:

[2×5=10]

- a) Construct CFG for the following

i)  $L_1 = \{0^n 1^n 2^m \mid n \geq 1, m \geq 0\}$

ii)  $L_2 = \{0^n 1^m \mid n, m \geq 0\}$

- b) Construct TM for language

$L = \{a^m b^n \mid n \geq m, m \geq 1\}$

- c) Construct the following CFG into Chomsky Normal Form (CNF)

$S \rightarrow A a B \mid a$

$A \rightarrow S B b \mid bA$

$B \rightarrow B a \mid b$

**Q4)** Attempt (A or B):

- A) a) Construct minimal DFA for the following: [4]

$M = (\{A, B, C, D, E\}, \{0, 1\}, \delta, A, \{E\})$

when  $\delta$  is given by

$\delta$	0	1
$\rightarrow A$	B	C
B	B	D
C	B	C
D	B	E
* E	B	C

- b) Construct PDA for  $L = \{a^n b^{2n+1} \mid n \geq 1\}$  [4]

- c) Define the following terms: [2]

i) Kleene closure.

ii) Derivation tree.

OR

- B) a) Construct a mealy machine to convert each occurrence of substring 101 by 100 over alphabet  $\{0, 1\}$ . [4]

- b) Construct PDA equivalent to the given CFG. [4]

$S \rightarrow b A B \mid a B$

$A \rightarrow a A B \mid a$

$B \rightarrow a B B \mid b$

- c) Show that CFL's are closed under concatenation. [2]

EEE

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P570**

**[5523]-303**

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-333 : Computer Networks-I**

**(Semester-III) (2013 Pattern) (Paper-III)**

*Time :2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following questions:

**[10×1=10]**

- a) Write disadvantages of star topology.
- b) List any four application layer protocols.
- c) State the applications of coaxial cable.
- d) Draw the frame format of PPP.
- e) If a composite signal is composed of five sine waves of frequencies 100, 300, 500, 700 & 900 Hz. What is the bandwidth of the signal?
- f) List the three types of MAC protocols.
- g) List data representation forms or types.
- h) State the connectors used with fiber optic cables.
- i) Draw NRZ-L encoding for bit pattern 00110110.
- j) Define Hamming distance.

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) What is computer Network? Describe any four goals of computer Network.
- b) Calculate maximum bit rate using Shannon's theorem for a channel having bandwidth 31000 Hz and S/N ratio 20dB.
- c) Write a note on microwave transmission.

**P.T.O.**

**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) Compare and contrast OSI and TCP/IP model.
- b) Explain the characteristics of line coding.
- c) Explain the Data link protocols for noiseless channel.

**Q4)** Attempt (A) or (B) of the following:

- (A) a) Define Bridge. List the types of Bridges and explain any one type in detail. **[5]**
- b) State the difference between Reservation and Polling. **[3]**
- c) State four levels of addresses used in TCP/IP. **[2]**

OR

- (B) a) What is channelization? List the methods of channelization. Explain any one method. **[5]**
- b) Define attenuation, distortion and Noise. **[3]**
- c) State advantages and disadvantages of mesh topology. **[2]**



Total No. of Questions : 4]

SEAT No. :

**P571**

[Total No. of Pages : 3

**[5523] - 304**

**T. Y. B. Sc. (Computer Science)**

**CS - 334: INTERNET PROGRAMMING –I**

**(2013 Pattern) (Semester - III) (Paper - IV)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Answer the following:

**[10×1=10]**

- a) What is web browser?
- b) Give function to check if variable has value or not.
- c) Write the purpose of explode function
- d) Define an Introspection
- e) How to delete file in Php?
- f) What are the different placeholders used in SQL query?
- g) Write the output of the following script.

```
< ? Php
```

```
$ a = 'PHP';
```

```
$ b = '$ a interpolation';
```

```
echo $ b;
```

```
? >
```

**P.T.O.**

- h) How will you find number of elements in array?
- i) What is use of serialization?
- j) What is a constructor?

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Explain the execution of Php script using diagram.
- b) Explain the following functions with example.
  - i) Ucwords ( )
  - ii) Trim ( )
  - iii) Str- Pad ( )
  - iv) Ucfirst ( )
  - v) Chunk - Split ( )
- c) Write a Php program to accept associative array of five expenses (electricity bill, phone bill, petrol bill property tax, college fees) and their respective amount of two persons. print the total expenditure of each person.

**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) What is inheritance? Explain with suitable example.
- b) Write a Php script to read a file DNA. TXT where file contains character A, T, C G and space. Count occurrences of each character and write it to the DNACOUNT. TXT file.
- c) Write steps to create connection with Postgre SQL database and display the data.

**Q4)** Attempt any one (either A or B) of the following.

- A) a) Explain the following statements with syntax and example [4]
- i) While statement
  - ii) Switch statement
- b) Explain different types of arguments passing to functions with example. [4]
- c) Explain Implode ( ) with suitable example. [2]

OR

- B) a) Consider the following relational data base
- Movie (Movie - no , Movie - name, year)
- Actor (Actor - no, Actor - name, Movie - no)
- Write Php script which accept movie - name and display actors acted in some movie. [4]
- b) Explain following functions. [4]
- i) fread ( )
  - ii) fwrite ( )
  - iii) fgetc ( )
  - iv) fgets ( )
- c) What is class? Give syntax of class declaration in Php. [2]

\* \* \*

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P572**

**[5523]-305**

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-335 : Programming in Java-I**

**(Semester-III) (2013 Pattern) (Paper-V)**

*Time :2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt all the following:

**[10×1=10]**

- a) What is JAR file?
- b) What is meant by Garbage collection?
- c) What is use of final keyword?
- d) “Import statement is not essential in Java”. True/False? Justify.
- e) What is Javadoc comments?
- f) Define Unchecked exception.
- g) List any two methods of file class.
- h) Which method is used for first time initialization in Applet?
- i) What is Anonymous classes?
- j) What is difference between repaint and update method.

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Explain Inner and Nested class with example.
- b) Write a Java program to illustrate multilevel inheritance such that state is inherited from country. City is inherited from state. Display city, state and country.
- c) Write a Java program to find second smallest element in an array.

**P.T.O.**



**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) Write a Java program to append the content of one file to another.
- b) What are user defined exceptions? Illustrate them with an example.
- c) What is package? How to create a package. Explain with example.

**Q4)** Attempt any one (either A or B) of the following:

- (A) a) Write a program to read string from user, reverse it and display the reverse string on textbox using Applets. **[5]**
- b) Write difference between Abstract class and Interface. **[3]**
- c) Enlist any two methods of string with syntax. **[2]**
- (B) a) Write a Java program which will create a frame if we try to close it. It should change its color Red and it display closing message on the screen.(Use swing) **[5]**
- b) What are the different types of dialogs in Java? Write any one in detail. **[3]**
- c) Which swing classes are used to create menu? **[2]**



Total No. of Questions :4]

SEAT No :

**P573**

**[5523]-306**

[Total No. of Pages : 2

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-336 : Object Oriented Software Engineering  
(Paper-VI) (2013-Pattern) (Semester- III)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following :

**[10×1=10]**

- a) What is inheritance?
- b) Define test case.
- c) Define link attributes.
- d) Define the object “Saving Account” with possible attributes and operations with visibility.
- e) Which Symbol is used to denote a node?
- f) “UML is a pure visual programming language.” State T/F. justify.
- g) What is meant by Inception?
- h) What is purpose of use case view?
- i) Define forking and joining.
- j) What do you meant by components?

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) What is Elaboration? State the significance of elaboration.
- b) Differentiate between aggregation and generalization with suitable examples.
- c) Discuss the components of Activity Diagram.

**P.T.O.**

**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) Give benefits of iterative development.
- b) Write a note on Coad and Yourdon method.
- c) A customer gives order which contains number of items. Customer gives payment either by cash on delivery, credit card, debit card whose details are maintained. Draw a class diagram for this applying relationship association with multiplicity. Use generalization and aggregation.

**Q4)** Attempt the following:

- a) The Government announces a scheme for LPG subsidy for Indian citizens, where applications are invited online. Many citizens have to apply and provide complete details with various documents such as adhar card, income certificate and bank details. Applicants can first register on the site then government authorities give one time password on mobile to verify the applicants. After successful registration, applicants can add, edit, delete and upload documents as and required. After final submission government authorities e-verify the documents and allowed or disallowed the application. Consider above case and draw the following diagrams.
  - i) Use case diagram. **[3]**
  - ii) Sequence diagram. **[4]**
- b) What is Integration Testing? Explain role of stub. **[3]**

OR

- b) For an automated vending machine for Coffee/Tea, a customer deposits a coin, select Coffee/Tea and get proper quantity of it from a machine. Draw a state transition diagram for the same. **[3]**

& & &

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 3

**P549**

**[5523]-4**

**F.Y. B.Sc. (Computer Science)**

**MATHEMATICS**

**MTC - 102 : Algebra and Calculus**

**(Paper -II) (2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of single memory, non-programmable, scientific calculator is allowed.*

**Q1)** Attempt any eight of the following:

**[16]**

- a) Give an example of a relation which is reflexive, but not transitive.
- b) Define : Partial order relation. Illustrate with example.
- c) Draw the digraph of the relation  $R$  on the set  $A = \{1, 2, 3, 4, 5\}$ , where  $R = \{(1, 1), (1, 3), (2, 1), (2, 5), (3, 3), (3, 2), (4, 5)\}$ .
- d) Which elements of  $\mathbb{Z}_6$  satisfy  $x^2 = x$ ?
- e) Prepare multiplication table for  $\mathbb{Z}_5$ .
- f) State Rolle's Mean Value Theorem.
- g) If  $y = \sin(2x + 3)$ , find  $y_n$ .
- h) Find reduced row echelon form of the matrix  $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$ .
- i) State Maclaurin's theorem with Cauchy's form of remainder.
- j) Give an example of a function to show that not every continuous function is differentiable.

**P.T.O.**

**Q2)** Attempt any four of the following:

**[16]**

- a) Find the remainder of  $7^{486}$  when divided by 13.
- b) Let  $S = \mathbb{R} - \left\{\frac{1}{2}\right\}$ . Define a binary operation  $*$  on  $S$  as  $a * b = a + b - 2ab$ .  
Show that  $*$  is associative. Find the identity element with respect to  $*$ .  
Also find inverse of 5 with respect to  $*$ .
- c) Find g. c. d. of 2210 and 357, and express it in the form  $d = 2210x + 357y$ , for some  $x, y \in \mathbb{Z}$ .
- d) Using finite induction prove that  $n^2 < 2^n, \forall n \geq 5$
- e) Let  $R$  be a relation on  $\mathbb{Z}$  defined as  $xRy$  if and only if  $6x + 7y$  is divisible by 13. Show that  $R$  is an equivalence relation.
- f) If  $a, b, c$  are integers such that  $c/(ab)$  and  $(b, c) = 1$ , then prove that  $c/a$ .

**Q3)** Attempt any two of the following.

**[16]**

- a) Prove by Mathematical induction that  $(3 + \sqrt{5})^n + (3 - \sqrt{5})^n$  is divisible by  $2^n, \forall n \in \mathbb{N}$ .
- b) Using Warshall's algorithm, obtain the transitive closure of the relation  $R$ , where  $R = \{(a, a), (a, c), (a, d), (b, a), (b, b), (c, b), (c, c), (d, a), (d, c), (d, d)\}$  on the set  $X = \{a, b, c, d\}$ .
- c) i) Show that a group  $G$  is abelian if and only if  $(ab)^2 = a^2b^2$  for all  $a, b \in G$ .  
ii) Let  $\sigma = (1, 5, 2)$  and  $\uparrow = (6, 1, 9, 7)$  compute  $\sigma \uparrow \sigma^{-1}$ .

**Q4)** Attempt any four of the following.

**[16]**

- a) Find Taylor series expansion of  $f(x) = 3^x$  at  $x = 1$ .
- b) Solve the following system of equations using Gauss Elimination method.  
$$\begin{aligned} 2x - y - 3z &= 0, \\ -x + 2y - 3z &= 0, \\ x + y - 4z &= 0 \end{aligned}$$

- c) Evaluate  $\lim_{x \rightarrow 0} \frac{\sin x - x}{x - \tan x}$ .
- d) Show that the function  $f: \mathbb{R} \rightarrow \mathbb{R}$  given by  $f(x) = \frac{x}{1 + e^{1/x}}$  if  $x \neq 0$   
 $= 0$  if  $x = 0$  is continuous every where.
- e) If  $y = \frac{x^2 + 4x + 1}{(x-1)(x+1)(x+2)}$ , then find  $y_n$ .
- f) If  $a < 1$ ,  $b < 1$ , and  $b > a$ , then prove that  

$$\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1} b - \sin^{-1} a < \frac{b-a}{\sqrt{1-b^2}}.$$

**Q5)** Attempt any Two of the following.

**[16]**

- a) If  $y = \sin^{-1} x$ , then prove that  $(1-x^2) y_{n+2} - (2n+1)x y_{n+1} - n^2 y_n = 0$ .
- b) Find LU - decomposition of the coefficient matrix and use this decomposition to solve the system.

$$\begin{bmatrix} 2 & -2 & -2 \\ 0 & -2 & 2 \\ -1 & 5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -4 \\ -2 \\ 6 \end{bmatrix}$$

- c) i) State and prove Cauchy's Mean Value Theorem.
- ii) Let  $f: \left[0, \frac{\pi}{2}\right] \rightarrow \mathbb{R}$  defined as  $f(x) = \cos x + \sin x$ . Verify Lagrange's Mean Value Theorem for  $f(x)$ .



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

**P574**

**[5523]-401**

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS - 341 : System Programming and Operating System - II**  
**(Paper – I) (2013 Pattern) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following.

**[10×1=10]**

- a) What is bootstrap loader?
- b) What is ready queue?
- c) What do you mean by multicore system?
- d) “Priority scheduling suffers from starvation”, True / False Justify.
- e) What is mutual exclusion?
- f) Define logical address.
- g) Which scheduler controls the degree of multiprogramming?
- h) List the deadlock handling techniques.
- i) What is compaction?
- j) Write file access methods.

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Explain MUT with example. Write its advantages.
- b) Write a short note on Dining philosopher problem.

**P.T.O.**

- c) Consider the following set of processes with CPU burst time and arrival time.

Process	Burst Time	Arrival Time
P1	4	1
P2	2	0
P3	1	2
P4	3	3
P5	3	10

Compute average turn around time and average wait time using Round Robin (RR) CPU scheduling algorithm with Time Quantum = 2, also draw the Gantt chart.

**Q3)** Attempt any two of the following:

**[2×5=10]**

- What is process? Explain the different types of process states.
- Explain demand paging with example. Discuss hardware required for demand paging.
- Consider given snapshot of system. A system has 5 processes and 3 types of resources A, B, C.

Allocation				Max				Available		
	A	B	C		A	B	C	A	B	C
P0	2	8	5	P0	3	10	6	0	2	1
P1	2	2	3	P1	3	4	3			
P2	3	2	2	P2	3	7	8			
P3	1	1	3	P3	1	2	3			
P4	3	3	4	P4	3	8	7			

Answer the following questions using Banker's Algorithm

- What is the content of need Matrix.
- Is the system in safe state? If yes, give the safe sequence.



**Q4)** Attempt any one (A or B)

- A) a) What is dispatch latency time? Write the functions performed by dispatcher. [4]
- b) Consider the following page reference string 7,2,8,4,5,8,4,7,6,1,3,7. How many page faults would occur for the following page replacement algorithms assuming four frames.
- i) LRU.
- ii) Optimal replacement. [4]
- c) Explain many-to-many multithreading model. [2]
- B) a) Explain linked allocation of disk space. [4]
- b) What is resource-allocation graph. Explain in detail. [4]
- c) Write the advantages of microkernels. [2]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

**P575**

**[5523]-402**

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-342 : Compiler Construction**

**(Semester-IV) (2013 Pattern) (Paper-II)**

*Time :2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following.

**[10×1=10]**

- a) Define Operand descriptors.
- b) Define Annotated parse tree.
- c) State True or False. Bottom-up parsing uses the process of derivation.
- d) Define cross compiler.
- e) State True or False. The yywrap( ) lex library function by default always return 1.
- f) List the techniques used in code optimization.
- g) Define the term handle.
- h) What is the purpose of augmenting the grammar?
- i) Name the data structures used while implementing the Dynamic memory Allocation.
- j) Give the name of the file which is obtained after compilation of the lex program by the Lex compiler.

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Check whether the given grammar is LL(1) or not.

$S \rightarrow aAB \mid c$

$A \rightarrow Ba \mid d$

$B \rightarrow bA \mid Ab \mid \epsilon$

**P.T.O.**

- b) Write a LEX Program which identifies the tokens like id, if, for and while.
- c) Write a Recursive Descent Parser (RDP) for the following grammar.

$$S \rightarrow aA \mid SbB$$

$$A \rightarrow aA \mid bB$$

$$B \rightarrow b$$

**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) Consider the following operator grammar.

$$S \rightarrow S+S \mid S*S \mid d$$

- i) Construct the operator precedence relation table.
- ii) Construct the precedence function table.
- b) Consider the following grammar and SDD of the grammar as given below.

$$D \rightarrow TL$$

$$T \rightarrow \text{int} \mid \text{float}$$

$$L \rightarrow L, \text{id} \mid \text{id}$$

The SDD is as follows.

Production	Semantic rules
1. $D \rightarrow TL$	$L.inh = T.val$
2. $T \rightarrow \text{int}$	$T.val = \text{int}$
3. $T \rightarrow \text{float}$	$T.val = \text{float}$
4. $L \rightarrow L_1, \text{id}$	$L_1.inh = L.inh$ $L.val = L_1.inh, \text{id}.val$
5. $L \rightarrow \text{id}$	$L.val = \text{id}.val$

Construct a dependency graph for the input string  $\text{int id}_1, \text{id}_2, \text{id}_3$

- c) Write a short note on Activation Record used in Dynamic memory allocation.

**Q4)** Attempt any one (either A or B) of the following.

- A) a) Check whether the given grammar is SLR (1) or not. [6]

$$S \rightarrow bAB \mid aA$$

$$A \rightarrow Ab \mid b$$

$$B \rightarrow aB \mid a$$

- b) Consider the expression  $a=b*(-c)+b*(-c)$ . [4]

Give

- i) Triple representation
- ii) Quadruple representation.

- B) a) Check whether the given grammar is canonical LR (1) or not. [6]

$$S \rightarrow bcS \mid SbA \mid a$$

$$A \rightarrow d$$

- b) Solve the following. [4]

- i) Define Directed Acyclic Graph (DAG). Construct DAG for the following expression  $(a+a*(c-b)+(c-b)*d)$
- ii) Define Flow graph. Draw a flow graph for the following three-address code.

1.  $p=0$
2.  $i=1$
3.  $t_1=4*i$
4.  $t_2=a[t_1]$
5.  $t_3=4*i$
6.  $t_4=b[t_3]$
7.  $t_5=t_2+t_4$
8.  $t_6=p+t_5$
9.  $p=t_6$
10.  $t_7=i+1$
11.  $i=t_7$
12. if  $i \leq 10$  goto 3



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P576**

**[5523]-403**

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-343 : Computer Networks-II**

**(Semester-IV) (2013 Pattern) (Paper-II)**

*Time :2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

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

**Q1)** Attempt all.

**[10×1=10]**

- a) What is the use of TTL field in IPv4.
- b) Convert dotted decimal IP address to binary address 255.255.0.0
- c) What are the types of bridges?
- d) What is congestion?
- e) Explain active web document.
- f) Explain full duplex communication in TCP.
- g) What is address resolution?
- h) What are the parts of Email address?
- i) Identify the address type for the MAC address FF:FF:FF:FF:FF:FF
- j) What is acknowledgment policy of data link layer for congestion control?

**Q2)** Attempt any two of the following:

**[2×5=10]**

- a) Give difference between WLAN and Bluetooth.
- b) What is firewall? Explain packet firewall.
- c) What are the services provided by user agent?

**P.T.O.**

**Q3)** Attempt any two of the following:

**[2×5=10]**

- a) Draw and explain UDP datagram.
- b) Explain hierarchical name space.
- c) Explain RARP. What are its advantages and disadvantages.

**Q4)** Attempt any one of the following. (A or B)

- (A) a) Explain 10Base5, 10Base2, 10Base-T, 10Base-F **[4]**
- b) Explain TCP features. **[4]**
- c) Explain dynamic and static address mapping in ARP. **[2]**
- (B) a) Define i) Plain Text ii) Cipher Text  
iii) Encryption iv) Decryption **[4]**
- b) Explain Host id and Net id of IP address classes. **[4]**
- c) Explain syntax of URL. **[2]**



Total No. of Questions : 4]

SEAT No. :

**P577**

[Total No. of Pages : 2

**[5523]-404**

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS-344 : Internet Programming - II**

**(2013 Pattern) (Paper - IV) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following :

**[10 × 1 = 10]**

- a) Write an elements of global array \$\_SERVER.
- b) Which are the two parts while message are sent using SMTP?
- c) What type of information is stored by \$\_FILES array?
- d) Give names of XML parser.
- e) What are different types of object that java script support?
- f) What are different values of read State property of XMLHttpRequest?
- g) What are non-primitive Data types in JavaScript?
- h) What is an AJAX?
- i) Write any two Advantages of JavaScript.
- j) Write any two applications of XML.

**Q2)** Attempt any two of the following :

**[2 × 5 = 10]**

- a) Write php script to select list of subjects i.e. O.S., TCS, N/W, PHP, JAVA, Graphics [Use multivalue parameter], display list on next page.
- b) Explain how to send email through PHP with example.
- c) What are different J.S. Control statements? Explain any two with example.

**P.T.O.**

**Q3)** Attempt any two of the following : **[2 × 5 = 10]**

- a) Write PHP script to read emp.xml file (contains empno, emp\_name, salary, designation) and print employee details in tabular format (use simple xml).
- b) Write a JavaScript code which will display patient master form having following fields patient Name, Addr, Contact No., Validate above fields with different criteria.
- c) Write an AJAX program to display list of game stored in an array on click ok Button.

**Q4)** Attempt any one (A or B) : **[1 × 10 = 10]**

- A)
- i) What is sticky form? Explain with example. **[4]**
  - ii) When IMAP<sub>4</sub> protocol is used in email handling? Explain its features. **[4]**
  - iii) Write a code using JavaScript to convert a string into uppercase. **[2]**

OR

- B)
- i) Differentiate between XML and HTML. **[4]**
  - ii) Write a note on Ajax Web Application model. **[4]**
  - iii) How would you destroy session variable both within the current script and form data store? **[2]**





Total No. of Questions :4]

SEAT No. :

**P 578**

**[5523]-405**

[Total No. of Pages : 2

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS - 345 : Programming in Java - II  
(2013 Pattern) (Semester-IV) (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following:

**[10×1=10]**

- a) Which method of Hashtable returns a duplicate of the invoking object.
- b) Explain the use of collection Interface?
- c) What is use of commit ( ) in Transactions in Java.
- d) Write Advantage of using Type4 driver in Database connectivity.
- e) Explain and write the syntax of getcookies ( ) method in servlet?
- f) State three methods which are used for session Tracking?
- g) Write a general syntax of include directive in JSP?
- h) Why synchronization is used to implement threading in Java?
- i) How do we set priority to threads?
- j) List any two methods of URL class?

**Q2)** Attempt any two of the following.

**[2×5=10]**

- a) What is precompiled sac? When it is used? Explain with an example?
- b) Write a servlet to get information about the server such as name of server, port number of server.
- c) Explain thread synchronization with an example.

**P.T.O.**

**Q3)** Attempt any two of the following.

**[2×5=10]**

- a) Write a JDBC program that accept department from user and display the employee information who have maximum salary from that department.
- b) Explain the Servlet Life Cycle.
- c) Write a Java program to accept names of n cities, insert the same into array list collection and display the content of the same array list, also remove all these elements.

**Q4)** Attempt any one of the following.(either A or B)

- A)
  - a) Explain scripting elements in JSP? **[4]**
  - b) What is URL? Explain any two methods of URL connection class. **[4]**
  - c) State two ways in creating a Thread. **[2]**
- B)
  - a) Explain lifecycle of JSP. **[4]**
  - b) Explain user Authorization in session with an Example. **[4]**
  - c) Explain use of setAuto Commit ( )? **[2]**



Total No. of Questions :4]

SEAT No. :

**P579**

**[5523]-406**

[Total No. of Pages : 2

**T.Y. B.Sc.**

**COMPUTER SCIENCE**

**CS - 346: Computer Graphics**

**(2013 Pattern) (Semester - IV) (Paper - VI)**

**Time : 2 Hours]**

**[Max. Marks : 40**

**Instructions to the candidates:**

- 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.*

**Q1)** Attempt all of the following.

**[10×1=10]**

- a) What is projection?
- b) What is shearing transformation?
- c) Define pixel.
- d) Name any four output devices.
- e) What is scan conversion.
- f) List out different Geometric transformation.
- g) Define frame Buffer.
- h) Give the two advances of LCD.
- i) Define Screen Resolution.
- j) List the component of display device.

**Q2)** Attempt any two of the following.

**[2×5=10]**

- a) Calculate final co-ordinates for point P(2, 3, 4) after following 3D transformation (use Matrix representation)
  - i) Rotate with angle  $60^\circ$  along X-axis.
  - ii) Reflect along XY plane.
- b) Generate points on the line with end points  $P_1(0, 0)$  and  $P_2(-6, -6)$  using DDA algorithm.
- c) Calculate the final co-ordinates for point [3, 6] after following 2D transformation (use Matrix Representation)
  - i) Translate with  $tx = 2$  &  $ty = 4$ .
  - ii) Rotate with angle  $30^\circ$ .

**P.T.O.**

**Q3)** Attempt any two of the following.

**[2×5=10]**

- a) Write a short note on shadow mask technique.
- b) Differentiate between object space method and image space method.
- c) List any four applications of computer Graphics.

**Q4)** Attempt (A) or (B).

**[4+4+2=10]**

- A)
  - a) Explain Cohen Sutherland Line Clipping algorithm.
  - b) Explain scan Line algorithm.
  - c) Define concave and convex polygon.

OR

- B)
  - a) Write a short note on Mouse.
  - b) Explain orthographic parallel projection.
  - c) State any four pick devices.



**P550**

**[5523]-5**

**F.Y. B.Sc. (Computer Science)**

**ELECTRONICS**

**ELC-101 : Principles of Analog Electronics**

**(2013 Pattern) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks : 80*

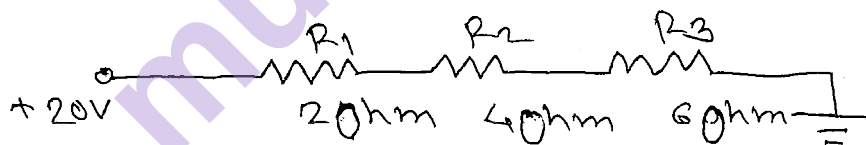
*Instructions to the candidates:*

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

**Q1)** Attempt all of the following :

**[8 × 2 = 16]**

- a) Define Pinch off voltage of JFET.
- b) Find the equivalent capacitance if all capacitor are in parallel  $C_1 = 10 \mu\text{F}$ ,  $C_2 = 12 \mu\text{F}$ .
- c) State Ohms law.
- d) Find out potential across the resistor  $R_1$ ,  $R_2$  and  $R_3$ .



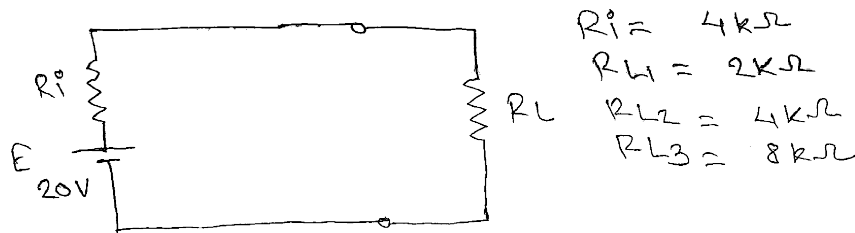
- e) Draw circuit symbol for
  - i) Varactor diode.
  - ii) Zener diode.
- f) Find  $\alpha$  if  $\beta = 50$ .
- g) Give ideal value of the following parameters for Op-Amp.
  - i) CMRR.
  - ii) Input resistance.
- h) Calculate the resistance of 80W bulb if current 600 mA result from an applied voltage of 230V.

**P.T.O.**

**Q2)** Attempt any four of the following :

[4 × 4 = 16]

- Draw a block diagram of power supply. Explain in brief function of each block.
- Verify maximum power transfer theorem for following Load Resistance.



- What is relay? Explain working principle of electromagnetic relay.
- Explain how BJT can be used as a switch?
- Draw & explain drain characteristics of n-channel JFET?
- Draw circuit diagram of inverting amplifier using Op-Amp and derive the expression for it's gain.

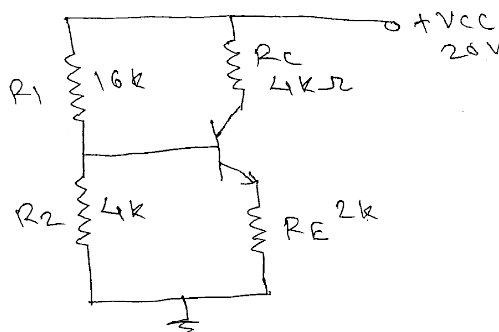
**Q3)** Attempt any four of the following :

[4 × 4 = 16]

- Explain the working principle of optocoupler?
- Define the following parameter of FET
  - Dynamic drain resistance.
  - Trans conductance.
  - Amplification factor.

Give the relationship between them.

- Draw D.C. Load Line for the following circuit and located Q point assume transistor to be Si = 0.5 Volt.

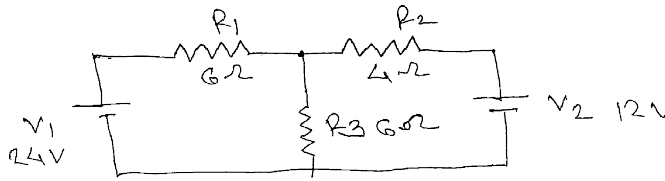


- What are the types of Fuses? What is used of fuse in electronic circuits?
- Explain the concept of virtual ground in Op-Amp.
- State and prove maximum power transfer theorem.

**Q4)** Attempt any four of the following :

[4 × 4 = 16]

- Write the working principle of Fiber optic cable?
- Find the voltage across resistor  $R_3$  by using KCL.

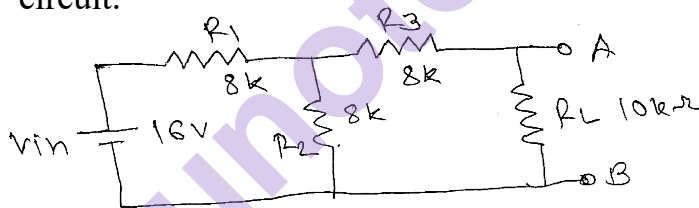


- Explain working of op-amp as a schmitt trigger.
- Write a short note on solar cell.
- Define  $\alpha$  &  $\beta$  in transistor and derive relationship between them.
- Explain working principle of UJT with neat diagram.

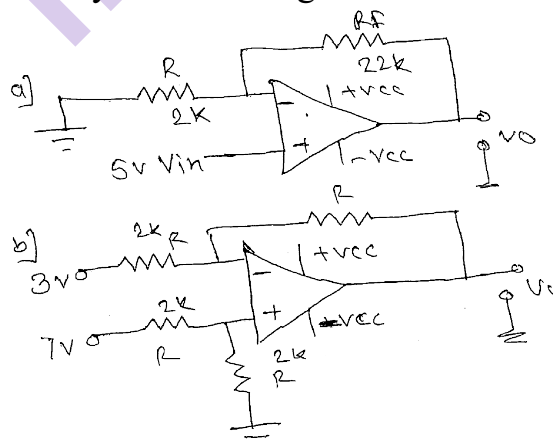
**Q5)** Attempt any two of the following :

[2 × 8 = 16]

- Define the following with respective switch
    - Pole
    - Throw and draw circuit symbol
    - SPDT
    - DPST-NO.
  - State Thevenin theorem find the Thevenin equivalent for the following circuit.



- What is Zener effect and Zener breakdown?
  - Identify the following circuit and Find output.



- Explain LCR series resonance circuit.
  - Explain classification of amplifier based on Q point with the help of neat diagram.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 5

**P552**

**[5523]-7**  
**F.Y. B.Sc.**  
**COMPUTER SCIENCE**  
**STATISTICS**  
**Statistical Methods - I**  
**(Paper -I) (2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of non-programmable, scientific calculator and statistical tables are allowed.*
- 4) *Symbols have their usual meaning unless otherwise stated.*

**Q1) A) Fill in the blanks.**

**[1each]**

- a) Mode is obtained graphically by \_\_\_\_\_
- b) Variance of the Poisson Distribution with parameter  $\lambda$  is \_\_\_\_\_
- c) The point of intersection of two lines of regression is \_\_\_\_\_
- d) Sum of probabilities of all values of a discrete random variable is \_\_\_\_\_

**B) Select the most appropriate option for each of the following. [1each]**

- a) Empirical relationship between mean, mode and median is \_\_\_\_\_
  - i) Mean–Mode = Mean–Median
  - ii) Mean–Median = 3 (Mean–Mode)
  - iii) Mean–Mode = 3 (Mean–Median)
  - iv) Mode–Mean = 3 (Mode–Median)
- b) \_\_\_\_\_ divide the total frequency into four equal parts.
  - i) Median
  - ii) Quartiles
  - iii) Decile
  - iv) Percentile.

**P.T.O.**



- c) The limits of Karl Pearson's coefficient of correlation are \_\_\_\_\_
- i) 0 to 1                                      ii) -1 to +1
- iii)  $-\infty$  to  $\infty$                                       iv) -1 to 0
- d) The coefficient of skewness is negative if \_\_\_\_\_ is negative.
- i)  $\mu_1$                       ii)  $\mu_2$                       iii)  $\mu_3$                       iv)  $\mu_4$

C) Attempt each of the following. [2each]

- a) State the additive property of Binomial distribution.
- b) State the formula for median for grouped frequency distribution.
- c) If  $V(X) = 4$  then find  $V(3X+2)$ .
- d) Find  $\beta_2$  if  $\mu_2=9$  and  $\mu_4=283.5$

Q2) Attempt any four of the following [4each]

- a) Mean daily salary of 50 employees in a firm is Rs.88.40. Frequency distribution of salaries of these employees is given below:

Daily Salary (Rs.)	40-60	60-80	80-100	100-120	120-140
No.of employees	6	—	17	—	5

Find the missing frequencies.

- b) Define:
- i) Class Limits
- ii) Exclusive class intervals
- iii) Open End class
- iv) Cumulative frequency of less than type.
- c) Define Arithmetic Mean (A.M.) and state its any two merits.

- d) A company dealing in 60 products, in the course of establishing an inventory control system, classified products according to price as shown in the frequency table as below:

Unit Cost (in '00 of Rs.)	3-6	6-9	9-12	12-15	15-18	18-21	21-24
No. of Items	6	8	10	20	8	5	3

Plot less than ogive curve and find the number of items having their price less than 800 Rs.

- e) Explain absolute and relative measures of dispersion.
- f) The following data pertains to two workers doing the same job in a factory

Workers	A	B
Mean time of completing the job	40	48
Standard deviation	12	8

Which worker is more consistent? Justify.

**Q3)** Attempt any four of the following.

**[4each]**

- a) Explain the procedure of obtaining Box-plot. State its uses
- b) Let the probability distribution of X be given by

X	0	1	2	3	4
P(X = x)	k	2k	3k	5k	2k

- i) Find the value of k
- ii) Find  $P(X \geq 2)$
- c) The first three moments about 'O' of a certain distribution are 1.5, 17 and -30. Find the coefficient of skewness and interpret the result.
- d) If a random variable X has discrete uniform distribution with parameter n. Find the value of n if  $V(X) = E(X)$ .
- e) Let X and Y be two independent variables having Binomial distribution with parameters (5, 0.5) and (8, 0.5) respectively. Find  $P\left[\frac{(x+y)}{3} \geq 1\right]$ .
- f) Define poisson distribution with one real life illustration. State its additive property.

**Q4)** Attempt any two of the following

**[8each]**

- a) i) Describe the stepwise procedure of fitting an exponential curve  $Y = ab^x$  by using the method of least square for a bivariate data.
- ii) Define coefficient of regression and state any two properties of it.
- b) Fit the equation  $y=a+bx+cx^2$  for the following data by the method of least squares.

x: 1 2 3 4 5

y: 6 8 7 9 11

- c) i) Find number of pairs of observations from the following data:  
 $r=0.5$ ,  $\Sigma(x-\bar{x})y=120$ ,  $\sigma_y=8$ ,  $\Sigma(x-\bar{x})^2=90$ .
- ii) Explain the concept of Kurtosis of frequency distribution with suitable diagram. State the measure of kurtosis.
- d) i) For bivariate data  $n=5$ ,  $\Sigma x=20$ ,  $\Sigma y=25$ ,  $\Sigma x^2=85$ ,  $\Sigma y^2=90$ ,  $\Sigma xy=75$ . Find the equation of line of regression of Y on X.
- ii) Explain 'Seasonal variation' as a component of time series with one illustration.

**Q5)** Attempt any one of the following:

**[16each]**

- a) i) Estimate the trend by using 4-yearly moving average method for the following data:

Year	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall(in mm)	648	603	576	657	444	519	576	551

- ii) Explain the concept of multiple correlation for a trivariate data with one illustration.
- iii) For a trivariate data,  $r_{12}=0.6$ ,  $r_{23}=0.8$ ,  $R_{1.23}=0.6$  find  $r_{13}$ .

b) i) In a trivariate distribution on

$X_1$ : Weight of father,  $X_2$ : Weight of mother and  $X_3$ : Weight of Daughter with

$$\begin{aligned}\bar{X}_1 &= 68kg, \bar{X}_2 = 70kg, \bar{X}_3 = 74kg, \\ \sigma_1^2 &= 100kg^2, \sigma_2^2 = 25kg^2, \sigma_3^2 = 81kg^2 \\ r_{12} &= 0.6, r_{13} = 0.7, r_{23} = 0.6\end{aligned}$$

Determine the equation of plane of regression of  $X_3$  on  $X_1$  and  $X_2$ .

ii) Explain the method of fitting of line of regression of X on Y for a bivariate data by method of least square method.



[5523]-8

F.Y. B.Sc. (Computer Science)

STATISTICS

Statistical Methods - II

(2013 Pattern) (Paper - II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of non-programmable, scientific calculator and statistical tables is allowed.
- 4) Symbols have their usual meanings unless otherwise stated.

**Q1) a)** Fill in the blanks : [4 × 1 = 4]

- i) Deterministic experiments are the experiments which result in \_\_\_\_\_ outcome.
- ii) A and B are any two events defined on the sample space S and if  $P(A) = 0.5$ ,  $P(B) = 0.6$  and  $P(A \cup B) = 0.8$  then  $P(A \cap B) = \underline{\hspace{2cm}}$ .
- iii) If a continuous random variable X follows Pareto distribution with parameter  $\alpha = 5$  then mean of X is \_\_\_\_\_.
- iv) Critical region is the region in the sample space where null hypothesis is \_\_\_\_\_.

**b)** Select most appropriate option for each of the following : [4 × 1 = 4]

- i) If  $X \sim U(2, 12)$  then the mean of X is
  - 1) 5
  - 2) 7
  - 3) 14
  - 4) 10
- ii) If X and Y are two independent variables following Normal distribution with parameters (10, 25) and (20, 36) respectively then  $2X + 3Y$  will follow normal distribution with parameters.
  - 1) (80, 424)
  - 2) (30, 61)
  - 3) (80, 61)
  - 4) (30, 424)
- iii) A test of hypothesis is said to be a two tailed test if the
  - 1) null hypothesis is two sided
  - 2) alternative hypothesis is one sided
  - 3) null hypothesis is one sided
  - 4) alternative hypothesis is two sided
- iv) For testing goodness of fit in case of small sample the appropriate test to be used is
  - 1) Kolmogorov-Smirnov test
  - 2) Chi-square test
  - 3) Mann-Whitney U test
  - 4) t-test

**P.T.O.**

- c) Attempt each of the following : [4 × 2 = 8]
- i) Determine the mean of the continuous random variable  $X$  with p.d.f.  
 $f(x) = 2x; \quad 0 \leq x \leq 1$   
 $= 0; \quad \text{otherwise}$
  - ii) Define combination. Also state one illustration where combination is used.
  - iii) State normal approximation to Poisson distribution.
  - iv) State any two advantages of simulation.

**Q2)** Attempt any four of the following : [4 × 4 = 16]

- a) A committee of three persons is to be formed from 5 Indians and 4 Americans. find the total number of committees that can be formed. How many of these will contain at least two Indians?
- b) List the elements of the sample space in each of the following cases and state its type :
  - i) A die is rolled until 6 appears.
  - ii) A card is drawn from a pack of cards and its colour as well as denomination is noted.
- c) Define :
  - i) An elementary event.
  - ii) Mutually exclusive events.
  - iii) Non-deterministic experiment.
  - iv) Impossible event.
- d) State classical definition of probability. Also state its limitations.
- e) Alphabets of the word 'PROGRAM' are arranged at random. Find the probability that in such an arrangement 2R's are together.
- f) A and B are any two events defined on the sample space S. If  $P(A) = 0.6$ ,  $P(B) = 0.7$  and  $P(A \cap B) = 0.4$  obtain  $P(A \cup B)$ ,  $P(A^c \cap B)$ ,  $P(A \cap B^c)$  and  $P(A^c \cap B^c)$ .

**Q3)** Attempt any four of the following : [4 × 4 = 16]

- a) State axiomatic definition of probability. Hence prove that  $0 \leq P(A) \leq 1$ .
- b) Define :
  - i) Probability density function of a continuous random variable (r.v.)  $X$ .
  - ii) Mode of a continuous random variable  $X$ .
- c) Following is the probability density function of a r.v.  $X$  :  
 $f(x) = cx^3; \quad 0 \leq x \leq 1$   
 $= 0; \quad \text{otherwise}$   
 Find :
  - i) the value of 'c'
  - ii)  $P(1/3 \leq X \leq 1)$
- d) If  $A_1, A_2, A_3, A_4$  are the events defined on the sample space such that they form the partition of the sample space, then find  $P(A_1 \cup A_2)$ , if  $P(A_1) = 2P(A_2) = 3P(A_3) = P(A_4)$ .

- e) If a random variable  $X \sim U(-2, 4)$  obtain  $P(-1 \leq X \leq 1)$  and  $P(X \geq 0)$ .
- f) State the probability density function of an exponential random variable with mean  $\theta$ . State any two real life situations where exponential distribution is used.

**Q4)** Attempt any two of the following : **[2 × 8 = 16]**

- a) i) Life of a certain electronic component is exponentially distributed with mean 10 years.  
Find the probability that such a component
  - 1) will last at least 12 years.
  - 2) will last between 10 years and 15 years.
- ii) State any four properties of the normal distribution.
- b) i) Describe run test procedure for testing the randomness of a sample.
- ii) Meteorological department claims that the average rainfall of Pune city is 1000 mm. over a long period of time. To test this claim a random sample of 50 years was selected and it gave average of 1050 mm, with standard deviation of 80 mm. At 5% level of significance can we accept the claim?
- c) i) Intelligence Quotient (I.Q.) of adults is normally distributed with mean 100 and s.d. 20. If an adult is selected at random find the probability that his I.Q.
  - 1) is less than 120.
  - 2) lies between 80 and 120.
- ii) Following are the counts of sulphur di-oxide (X) (in tons) emitted by large industrial plant on 20 days :  
17, 15, 20, 29, 19, 18, 22, 25, 27, 9, 24, 20, 17, 6, 24, 14, 15, 23, 24, 26.  
Apply sign test to test the hypothesis that population median of X is 21.5 or not. Use 5% level of significance.
- d) i) State and explain procedure of model sampling from normal distribution using Box-Muller transformations.
- ii) A health club advertised a weight reducing program and claimed that on an average participant in the program loses weight in 6 months. A person wanted to verify the claim. He selected records of 10 participants and noted their weights before joining the club and their weight after completing the 6-months program. The data is as follows :
 

Participant Number :	1	2	3	4	5	6	7	8	9	10
Weight before joining : the club (in lbs.)	120	125	115	130	123	119	122	127	128	118
Weight after joining : the club (in lbs.)	111	114	107	120	115	112	112	120	119	112

Do the above data support the claim of the health club? Use 5% level of significance.

**Q5)** Attempt any one of the following :

**[1 × 16 = 16]**

a) i) Define :

**[4]**

- 1) Simple random sampling.
- 2) Hypothesis.
- 3) Level of significance.
- 4) Type II error.

ii) Theory predicts that the proportion of beans in 3 groups A, B and C should be in the ratio 1 : 2 : 3. In an experiment on 300 beans the frequencies in the three groups were found to be 45, 105 and 150 respectively. Does the experiment support the theory? Justify? Use 2% level of significance. **[4]**

iii) The following are the lengths of time (in minutes) spent in operating room by 20 patients undergoing the same operative procedure.

Hospital A : 35, 30, 33, 39, 41, 29, 30, 36, 45, 40, 31

Hospital B : 45, 38, 42, 50, 48, 51, 32, 37, 46

From the above data, can we conclude that, for the same operative procedure, patients in hospital B tend to be in the operating room longer than patients in hospital A using Mann-Whitney U test. Use 1% level of significance. **[8]**

b) i) Explain the procedure of testing the equality of two population proportions based on large samples. **[4]**

ii) A group of 50 girls and 40 boys was asked to give their preference between two brands of mobile hand sets. The results obtained are as follows : **[4]**

	Brand I	Brand II
Boys	23	17
Girls	20	30

Test at 5% level of significance whether preference of a particular brand is independent of Gender.

iii) The following table gives the data on number of absentees of a student (X) and marks obtained by that student in internals (out of 20) (Y) :

X: 3 4 5 6 8 11

Y: 18 12 10 8 7 5

Compute the value of correlation coefficient between X and Y and test its significance at 5% level of significance. **[8]**

