Q.P. Code :23022

[Time: Three Hours]   **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Question.No.1 is compulsory.
         2. Attempt any three questions from Q.2 to Q.6
         3. Use of statistical table permitted.
         4. Figures to the right indicate full marks.

a) Evaluate $\int_c \log z \, dz$ where C is the unit circle in the z - plane.   05

b) Find the eigen values of the adjoint of $A = \begin{bmatrix} 2 & 0 & -1 \\ 0 & 2 & 0 \\ -1 & 0 & 2 \end{bmatrix}$ 05

c) If the arithmetic mean of regression coefficient is p and their difference is 2q, find the correlation coefficient.   05

d) Write the dual of the following L.P.P.   05
    Maximise $Z = 2x_1 - x_2 + 4x_3$
    Subject to $x_1 + 2x_2 - x_3 \le 5$
                 $2x_1 - x_2 + x_3 \le 6$
                 $x_1 + x_2 + 3x_3 \le 10$
                 $4x_1 + x_3 \le 12$
                 $x_1, x_2, x_3 \ge 0$

a) Evaluate $\int_C \frac{\cot z}{z} \, dz$ where C is the ellipse $9x^2 + 4y^2 = 1$ 06

b) Show that $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$ is non- derogatory.   06

c) If X is a normal variate with mean 10 and standard deviation 4, find   08
    i)$P(|X - 14|<1)$, ii) $P(5 \le X \le 18)$, iii) $P(X \le 12)$

Page **1** of 3

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a) Find the expectation of number of failures preceeding the first success in an infinite series of independent trials with constant probabilities p & q of success and failure respectively.   06

b) Using Simplex Method solve the following L.P.P

Maximise $Z = 10x_1 + x_2 + x_3$ 06

Subject to $x_1 + x_2 - 3x_3 \le 10$

            $4x_1 + x_2 + x_3 \le 20$

            $x_1, x_2, x_3 \ge 0$

c) Expand $f(z) = \dfrac{1}{z(z+1)(z-2)}$

  (i)   Within the unit circle about the origin.   08

  (ii)   with in the annulus region between the concentric circles about the origin having radii 1 and 2 respectively.

  (iii)   In the exterior of the circle with centre at the origin and radius 2.

a) If X is Binomial distributed with mean=2 and variance = 4/3, find the probability distribution of X.   06

b) Calculate the value of rank correlation coefficient from the following data regarding score of 6 students in physics & chemistry test.   06

Marks in Physics   :   40, 42, 45, 35, 36, 39

Marks in Chemistry :   46, 43, 44, 39, 40, 43

c) Is the matrix A= $\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ diagonalisable? If so find the diagonal form and the transforming matrix.   08

a) A random sample of 50 items gives the mean 6.2 and standard deviation 10.24 . Can it be regarded as drawn from a normal population with mean 5.4 at 5% level of significance?   06

b) Evaluate $\int_0^\infty \dfrac{dx}{(x^2+a^2)^3}$, a>0 Using Cauchy's residue theorem.   06

c) Using Kuhn-Tucker condition to solve the following N.L.P.P   08

Maximise $Z = 8x_1 + 10x_2 - x_1^2 - x_2^2$

Subject to $3x_1 + 2x_2 \le 6$

            $x_1, x_2 \ge 0$

a) The following table gives the number of accidents in a city during a week. Find whether   06
the accidents are uniformly distributed over a week.

Day:	Sun,	Mon,	Tue,	Wed,	Thu,	Fri,	Sat,	Total.
No. of accidents:	13	15	9	11	12	10	14	84

b) If two independent random samples of sizes 15 & 8 have respectively the following   06
means and population standard deviations,

$$\overline{X_1} = 980 \qquad \overline{X_2} = 1012$$
$$\sigma_1 = 75 \qquad \sigma_2 = 80$$

Test the hypothesis that $\mu_1 = \mu_2$ at 5% level of significance,

(Assume the population to be normal)

  08

c) Using Penally (Big M) method solve the following L.P.P.
Minimise $Z = 2x_1 + x_2$
Subject to $3x_1 + x_2 = 3$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 3$$
$$x_1, x_2 \geq 0$$

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Q.P. Code :13172

Max Marks: 80

Time Duration: 3 Hrs

Note : Question number 1 is Compulsory.   Solve any Three questions from Remaining.

Q1. Answer Following Questions (Any Four)

20M

a) What is backtracking Approach. Explain how it is used in graph coloring.
b) Explain Randomized algorithm with example.
c) What is Knuth Morris Pratt Method of Pattern Matching? Give Examples.
d) Explain in brief the concept of Multistage Graphs?
e) Merge sort and its complexity.

Q2. A) Derive and comment on the complexity of Quick Sort algorithm.

10M

b) Solve Following Knapsack problem using dynamic approach.

10M

N=4 items, capacity of knapsack M= 9

Item i	Value vi	Weight wi
1	18	2
2	25	4
3	27	5
4	10	3

Q3. A) What is sum of Subset problem? Write the Algorithm and solve following.   10M

array A = [2,3,5,6,7,8,9] and K = 15

b) Write the algorithm for finding strassens matrix multiplication and show how the complexity is being affected?.

10M

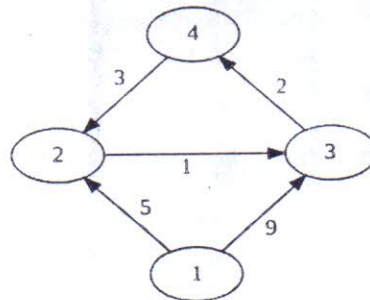Q4. A) What is Longest Commom subsequence Problem? Find LCS for following.   10M

String x = **ACBAED**

String y = ABCABE

b) Explain binary search Tree? How to generate an optimal binary search tree.   10M

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Q5. A) What is all pairs shortest path algorithm? Apply the same on following Graph.   10M

b) Find MST of Following Graph using Prims and Prism's Algorithm.   10M
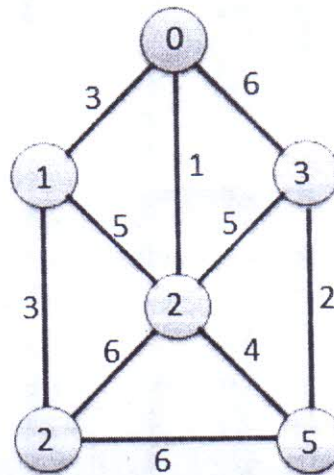
Q6. Write Short Notes on (Any Three)   20M

    a)   Optimal Storage on Tapes
    b)   15 puzzle problem.
    c)   Binary Search and its complexity.
    d)   Problem of Multiplying Long Integers.

Q.P. Code :13083

[Time: Three Hours]   [Marks:80]

Please check whether you have got the right question paper.

N.B: 1. Question no 1 is compulsory.
       2. Attempt any three questions from remaining five questions.
       3. Assume suitable data if required
       4. Draw neat diagram wherever necessary.

1. Solve any four   20

A. List different memory organization characteristics.

B. What is IO buffering?

C. In floating point representation how to identify sign of exponent?

D. What is virtual memory?

E. What is TLB?

2. A. I) Draw the flow chart for Booth's Algorithm for two's complement multiplication.   4

   II) Using Booth's algorithm Multiply 14 times -5.   6

B. Describe hard-wire control unit and specify its advantages.   10

3. A. Compare interrupt driven I/O and DMA   10

B. Calculate the hit and miss using various page replacement policies LRU, OPT, FIFO for following   10
sequence (page frame size 3) 4,7,3,0,1,7,3,8,5,4,5,3,4,7,534 state which one is best for above example?

4. A. Explain set associative and associative cache mapping techniques   10

B. Explain Flynn's classification   10

5. A. Explain six stage instruction pipeline with suitable diagram.   10

B. Differentiate between I. RISC and CISC II. SRAM and DRAM   10

6. A. Explain different pipe lining hazards   10

B. Explain in brief cache coherency problem   10

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Q. P. Code: 18508

(3 Hours)   **Total Marks: 80**

N.B.: (1) Question No.**1** is **compulsory**.
(2) Solve any **three** questions out of the remaining questions.
(3) Make **suitable** assumptions if **needed**.

1. (a) Describe Data Independence.   5
   (b) Compare File System and Database System.   5
   (c) Explain ACID properties.   5
   (d) Explain Aggregate Functions in SQL.   5

2. (a) Define Normalization. Discuss different Normalization Techniques with example.   10
   (b) Describe the overall architecture of DBMS with suitable diagram.   10

3. (a) Explain types of integrity constraints with example.   10
   (b) Draw an ER Diagram and convert it into relational model for a Company, which   10
       has several Employees working on different types of Projects. Several Employees
       are working for one Department, every Department has a Manager.
       Several Employees are supervised by one Employee.

4. (a) Discuss Data Definition and Manipulation Commands in SQL.   10
   (b) Explain Security and Authorization in DBMS.   10

5. (a) Explain the following Relational Algebra Operations with example: 10
          i. Cartesian Product   iii. Project
         ii. Natural Join   iv. Union

   (b) Explain Log based recovery and shadow paging in detail.   10

6. Write Short notes on: 20
   (a) Steps in Query Processing
   (b) Role of Database Administrator
   (c) Deadlocks
   (d) Specialization and Aggregation

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(3 Hours)   [Total Marks: 80]

N.B.   (1) Question No. 1 is compulsory
        (2) Attempt any three out of remaining five questions
        (3) Assumptions made should be clearly stated

1. (a) Explain Chomsky Hierarchy   5
    (b) Differentiate between DFA and NFA   5
    (c) Explain Recursive and Recursively enumerable languages   5
    (d) Define Regular Expression. Design R.E. for strings ending in consecutive 1's 5
        over $\sum=\{0,1\}$.

2. (a) Design a Finite State Machine to determine whether ternary number(base 3)   10
        is divisible 5.
    (b) Give and Explain formal definition of Pumping Lemma for Regular Language and 10
        prove that following language is not regular.
            $L=\{ a^n b^n \mid n >=1 \}$

3. (a) Design a PDA that checks for well-formed parenthesis.   10

    (b) Consider the following grammar   10

            $S \rightarrow i C t S \mid i C t S e S \mid a$

            $C \rightarrow b$

        For the string 'ibtibtaea' find the following:

            (i)   Leftmost derivation
            (ii)   Rightmost derivation
            (iii)   Parse tree
            (iv)   Check if above grammar is ambiguous.

4. (a) Design a Turing Machine that recognizes palindrome string where $\sum=\{a,b\}$. 10
    (b) Reduce following grammar to GNF.   10

            $S \rightarrow AB$

            $A \rightarrow BSB \mid BB \mid b$

            $B \rightarrow a$

        (i) $S \rightarrow 01S \mid 01$

                $S \rightarrow 10S \mid 10$

                $S \rightarrow 00 \mid \varepsilon$

5. (a) Convert $(0+\varepsilon) (10)*(\varepsilon+1)$ into NFA with ε-moves and obtain DFA. 10
    (b) Design a PDA to accept language $\{ a^{n-1} b^{2n+1} \mid n>=1 \}$ 10

6. Write short note on following (any 4)   20

    (a) Closure properties of Context Free Language

    (b) Applications of Regular expression and Finite automata

    (c) Rice's Theorem

    (d) Moore and Mealy Machine

    (e) Differentiation between DPDA and NPDA

QP CODE: 24607

Duration: 3 Hours   Total Marks assigned: 80

N.B.: (1) Question No. **1 is compulsory**.
    (2) Attempt any **three** of remaining **five** questions.
    (3) Assume any suitable **data** if necessary and justify the same.

1.	(a)	What is antialiasing? Explain any one method of antialiasing.	[05]
	(b)	Define shearing and give example.	[05]
	(c)	Derive the transformation matrix for fixed point scaling.	[05]
	(d)	Explain inside outside test used in filling algorithm.	[05]
2.	(a)	Explain the midpoint circle generation algorithm.	[10]
	(b)	Discuss all the steps used in reflection of an object about an arbitrary line with an example.	[10]
3.	(a)	Explain the Cohen-Sutherland line clipping algorithm with suitable example.	[10]
	(b)	Explain any one polygon clipping algorithm.	[10]
4.	(a)	Define window, viewport and derive window to viewport transformation.	[10]
	(b)	Discuss parallel and perspective projections.	[10]
5.	(a)	Discuss Bezier curve with its properties.	[10]
	(b)	Explain Gouraud and Phong shading along with their advantages and disadvantages	[10]
6.		Write a short note on any **two** of the following	[20]
	(a)	3-D representation methods.	
	(b)	Area Subdivision method	
	(c)	Fractals.	

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