

QP Code : 541304

(3 Hours)

[Total Marks : 80

- N.B. :** (1) Question No. **one** is **compulsory**.
 (2) Answer **any three** questions from **Q.2 to Q.6**
 (3) Use of statistical Tables permitted.
 (4) Figures to the **right** indicate **full** marks
 (5) Assume suitable data wherever applicable.

1. (a) Find the Eigenvalues and eigenvectors of the matrix.

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

- (b) Evaluate the line integral $\int_0^{1+i} (x^2 + iy) dz$ along the path $y = x$

- (c) Find k and then $E(x)$ for the p.d.f.

$$f(x) = \begin{cases} k(x-x^2), & 0 \leq x \leq 1, k > 0 \\ 0 & , \text{ otherwise} \end{cases}$$

- (d) Calculate Karl Pearson's coefficient of correlation from the following data.

x	100	200	300	400	500
y	30	40	50	60	70

2. (a) Show that the matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$ is non-derogatory.

- (b) Evaluate $\int \frac{e^{2z}}{(z+1)^4} dz$ where C is the circle $|z-1|=3$

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

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3. (a) Find the relative maximum or minimum (if any) of the function 6
 $Z = x_1^2 + x_2^2 + x_3^2 - 4x_1 - 8x_2 - 12x_3 + 100$
- (b) If x is Binomial distributed with $E(x) = 2$ and $V(x) = 4/3$, find the probability distribution of x . 6

(c) If $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$, find A^{50} . 8

4. (a) Solve the following L.P.P. by simplex method 6
 Minimize $z = 3x_1 + 2x_2$
 Subject to $3x_1 + 2x_2 \leq 18$
 $0 \leq x_1 \leq 4$
 $0 \leq x_2 \leq 6$
 $x_1, x_2 \geq 0$.

- (b) The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls. 6

- (c) Find Laurent's series which represents the function $f(z) = \frac{2}{(z-1)(z-2)}$ 8
 When (i) $|z| < 1$, (ii) $1 < |z| < 2$ (iii) $|z| > 2$

5. (a) Evaluate $\int_C \frac{z^2}{(z-1)^2(z+1)} dz$ where C is $|z| = 2$ using residue theorem 6

- (b) The regression lines of a sample are $x+6y=6$ and $3x+2y=10$ Find 6
 (i) Sample means \bar{x} and \bar{y}
 (ii) Correlation coefficient between x and y . Also estimate y When $x = 12$

- (c) A die was thrown 132 times and the following frequencies were observed 8

No. obtained	1	2	3	4	5	6	Total
Frequency	15	20	25	15	29	28	132

Using χ^2 -test examine the hypothesis that the die is unbiased.

6. (a) Evaluate $\int_{-\infty}^{\infty} \frac{x^2 + x + 2}{x^4 + 10x^2 + 9} dx$ using contour integration. 6

(b) If a random variable x follows Poisson distribution such that $P(x=1) = 2P(x=2)$ Find the mean and the variance of the distribution. Also find $P(x=3)$. 6

(c) Use Penalty method to solve the following L.P.P. 8

Minimize $z = 2x_1 + 3x_2$

Subject to $x_1 + x_2 \geq 5$

$$x_1 + 2x_2 \geq 6$$

$$x_1, x_2 \geq 0.$$

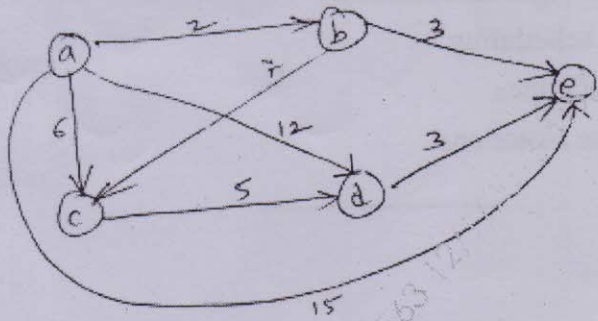
QP Code : 541400

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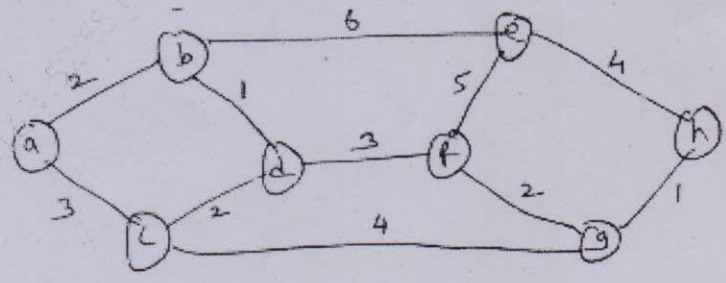
[Total Marks: 80

N.B.: (1) Q.1 is Compulsory.
(2) Attempt any three from remaining five questions.

- 1. (a) Which are the different methods of solving recurrences. Explain with examples. 10
- (b) Compare Greedy and dynamic programming approach for algorithm Design. Explain How both can be used to solve Knapsack problem? 10
- 2. (a) Explain the analysis of quick sort and apply the same to sort following data. [10 7 5 9 12 3] 10
- (b) Write single source shortest path algorithm & apply the same for following. 10



- 3. (a) Explain string matching with finite automata and apply the same technique to match following pattern.
txt [] = UNIVERSITY OF MUMBAI
pat [] = MBA 10
- (b) Compare Prim's & Kruskal's method for finding Minimum spanning Tree find MST for following using prim's method. 10



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4. (a) Explain with example how divide and conquer strategy is used in binary search? 10
- (b) Solve sum of subsets problem for following 10
 $N = 6$ $W = \{ 3, 5, 7, 8, 9, 15 \}$ & $M = 20$
Also write the Algorithm for it.
5. (a) Explain longest common subsequence problem with example. 10
- (b) What is backtracking method? How it is used in graph coloring problem? 10
6. Write short notes on **(Any Four)** 20
- (1) 8 queens problem
 - (2) Job sequencing with deadlines
 - (3) Flow shop scheduling
 - (4) Multistage Graphs
 - (5) Asymptotic Notations
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Q.P. Code : 541502

(3 Hours)

[Total Marks : 80

- N.B. : (1) Question No.1 is compulsory.
(2) Solve **any three** questions out of remaining **five** questions.
(3) Assume suitable **data** if **necessary**.

1. Attempt **any four** out of **five** questions.
 - (a) Explain Von Neumann architecture in detail. 5
 - (b) Explain various pipeline hazards with example. 5
 - (c) Differentiate between Computer Organization & Architecture. 5
 - (d) Explain Flynn's Classification. 5
 - (e) What are the differences between RISC and CISC processors. 5
2. (a) Convert $(127.125)_{10}$ in IEEE-754 single and double precision floating point representation. 10
(b) Explain micro instruction sequencing and execution. 10
3. (a) Calculate the hit and miss using various page replacement policies LRU, OPTIMAL, FIFO for following sequence (page frame size = 3) 4, 7, 3, 0, 1, 7, 3, 8, 5, 4, 5, 3, 4, 7. State which one is best for above example? 10
(b) Explain the importance of multiple bus hierarchies with the help of suitable diagram. 10
4. (a) Describe Hardwired Control Unit and specify its advantages. 10
(b) Describe the characteristics of Memory. 10
5. (a) Explain DMA based data transfer technique for I/O devices. 10
(b) Multiply (-7) with (4) by using Booth's algorithm of Multiplication. 10
6. Write short notes on (**any four**) : 20
 - (a) Types of ROM
 - (b) Cache Coherency
 - (c) Scanner
 - (d) Interrupt driven I/O
 - (e) Nano Programming

- 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) Give the advantages of DBMS over File Processing Systems. 5
 (b) What are the steps involved in Query Processing. 5
 (c) Explain Shadow Paging in brief. 5
 (d) Define Super Key and Candidate Key with an example. 5

2. (a) Discuss conflict serializability and view serializability with examples. 10
 (b) Describe the overall architecture of DBMS with suitable diagram. 10

3. (a) Explain the following Relational Algebra Operations with example: 10
 i. Natural Join iii. Project
 ii. Union iv. Select
 (b) Explain types of integrity constraints with example. 10

4. (a) What is Normalization? Explain 1NF, 2NF, 3NF and BCNF giving examples. 10
 (b) Consider the following database schema: 10

 Employee(employee_name, street, city, date_of_join)
 Works(employee_name ,company_name, salary)
 Company(company_name, city)
 Manages(employee_name, manager_name)
 Solve the following queries using SQL:
 i. Give all employee of ABC Company a 25% rise.
 ii. Find all employees who live in the same cities and on the same street as their manager.
 iii. Find all employees who join in the month of April.
 iv. Delete the Smith belonging to XYZ Company.

5. (a) What is an attribute? Discuss various types of attributes with examples. 10
 (b) Explain Security and Authorization in DBMS. 10

6. Write Short notes on: 20
 (a) Total and Partial Participation
 (b) Data Independence
 (c) ACID Properties
 (d) Aggregate Functions in SQL

