

Time: 3 Hours

Max. Marks: 80

- N.B. (1) Question one is Compulsory.**
(2) Attempt any 3 questions out of the remaining.
(3) Assume suitable data if required.

Q. 1

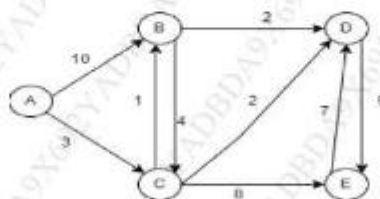
- a) What is job sequencing with deadlines? Let the number of jobs be $n=4$, with profits $(P_1, P_2, P_3, P_4) = (100, 10, 15, 27)$ and deadlines $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1)$. (05)
 Solve the problem to find the optimal solution using greedy method.
- b) Write algorithm for insertion sort and sort the following elements using the same: (05)
 22, 15, 11, 16, 19. Show all the passes.
- c) Give the algorithm to solve the N-Queen Problem using backtracking. Give any 2 (05)
 solutions for the 4-Queen Problem.
- d) Show the steps and find number of shifts to find the Pattern "abc" in the Text (05)
 String "abaaabccb" using Naïve String Matching Method.

Q. 2

- a) Explain O , Ω and Θ notations with appropriate equations and graphs. (10)
- b) Solve the sum of subsets problem using backtracking for the following: $n=4$, (10)
 $m = 17$, $w = \{2, 7, 8, 15\}$. Show the entire state space tree and find all the solutions.

Q. 3

- a) Write an algorithm for Merge Sort. Derive its time complexity using the (10)
 substitution method. Sort the following elements with using Merge Sort: 25, 11, 8,
 39, 13, 12
- b) Find the single source shortest path for the following graph using Greedy Method. (10)
 Take vertex A as the source vertex



Q. 4

- a) Write algorithm for 0/1 knapsack using dynamic programming and obtain the (10)
 solution to following 0/1 knapsack problem where: $n = 4$, Knapsack Capacity
 $M = 5$, Weights $(W_1, W_2, W_3, W_4) = (2, 3, 4, 5)$ and profits (P_1, P_2, P_3, P_4)
 $= (3, 4, 5, 6)$.
- b) Explain with an example how the Travelling Salesman Problem can be solved (10)
 using Branch and Bound method.

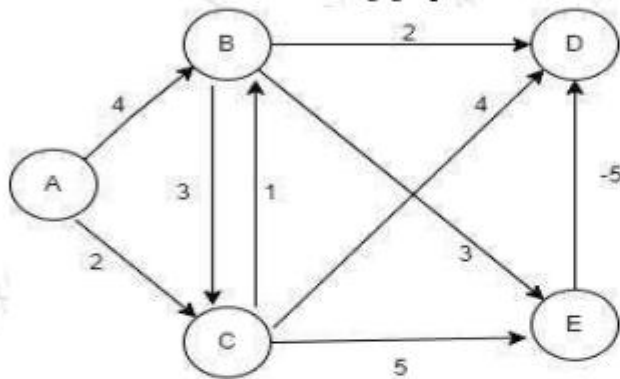
Q. 5

- a) Give a suitable algorithm to find minimum and maximum element in a list using divide and conquer approach. Explain the approach with an example (Consider a list having atleast 7 elements). Discuss the time complexity for all cases. (10)
- b) Give an algorithm to find Longest Common Subsequence between two sequences using Dynamic Programming. Also, find the LCS for the following strings: X = "SAVANT" (10)

Y = "ADVENT"

Q. 6

- a) Give an algorithm to solve the All-pairs shortest path problem using dynamic programming. What is its time complexity? Find the All-pairs shortest path for all the vertices for the following graph. (10)



- b) Give the Rabin-Karp Algorithm for string matching. Explain its working with a suitable example. List a few areas where String Matching Algorithms can be applied. (10)

(Time : 3 Hours)

(Total Marks: 80)

- NB. 1. Question number one is compulsory**
2. Attempt any three out of remaining five questions
3. Assume suitable data
4. Figures to the right indicate the maximum marks

- Q.1 Attempt any FOUR: (20)**
- a) Differentiate between Database Management System and File System. **05**
 - b) Explain aggregate functions with syntax and suitable example. **05**
 - c) Explain type of functional dependency with suitable example. **05**
 - d) Describe types of Entities with example. **05**
 - e) Explain Log based recovery. **05**
- Q.2 a) Explain overall architecture of DBMS in detail with appropriate diagram. (10)**
Explain Relational Algebra-operators given below:
- b) 1. Select **(10)**
2. Project
3. Union
4. Rename
- Q.3 a) Draw EER Diagram for Hospital Management system and Map it to Relational Model (10)**
b) Discuss types of Joins in sql with syntax and example.. **(10)**
- Q.4 a) Write SQL queries for given database. (10)**
employee (eno, ename, bdate, title, salary, dno)
project (pno, pname, budget, dno)
department (dno, dname, mgreno)
works (eno, pno, resp, hours)
- 1) Find the project number and name for projects with a budget greater than 100,000.
 - 2) Find the employees (name only) in department 'D1' ordered by descending salary.
 - 3) Find all works records where hours worked is less than 10 and the responsibility is 'Manager'.
 - 4) Find name of employees that are ending with letter ' s'.
 - 5) Find total number of employee.
 - 6) Write the query to in increase salary of the employees by 10%.
 - 7) Find Employee name with maximum salary.
- b) Explain all types of integrity constraints with an example? **(10)**
- Q.5 a) Define Normalization. Explain 1NF ,2NF ,3NF and BCNF with examples. (10)**
b) Write note on **(10)**
- i) Log based protocol
 - ii) Timestamp-based protocols
- Q.6 a) What is deadlock? Give deadlock prevention and detection with suitable example (10)**
b) Explain concept of Serializability along with Conflict Serializability and View Serializability **(10)**

(Time : 3 Hours)

(Total Marks : 80)

Note :

- 1) Q. No. 01 is compulsory.
- 2) Solve any three from Q. No. 02 to 06.
- 3) Numbers to the right indicate full marks.
- 4) Use of statistical tables is allowed.

Q. 1. Solve.

- a) If $A = \begin{bmatrix} -1 & 2 & 38 \\ 0 & 2 & 37 \\ 0 & 0 & -2 \end{bmatrix}$ find the Eigen values of $A^3 + 5A + 8I$. 05
- b) Integrate the function $f(z) = x^2 + ixy$ from A(1, 1) to B(2, 4) along $y = x^2$ 05
- c) Find the Z-Transform of $f(k) = a^{-k}$, $k \geq 0$. 05
- d) If a random variable X follows Poisson distribution such that $P(x = 1) = 2 P(x = 2)$. Find mean and variance of the distribution. 05

Q. 2.

- a) Find the Eigenvalues and Eigenvectors of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$. 06
- b) Find the Z-Transform of $\cos\left(\frac{\pi}{4} + k\alpha\right)$, $k \geq 0$. 06
- c) Use the dual simplex method to solve the LPP
 Min. $Z = 2X_1 - X_2 + 3X_3$, 08
 $3X_1 - X_2 + 3X_3 \leq 7$, $2X_1 - 4X_2 \geq 12$, $X_1, X_2, X_3 \geq 0$

Q. 3.

- a) Evaluate $\int_C \frac{z+8}{z^2+5z+6} dz$ Where C is a circle $|z|=5$. 06
- b) Verify Cayley-Hamilton theorem and hence find A^{-1} and A^4 where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$. 06
- c) Solve the LPP by Big -M method
 Max. $Z = X_1 + 2X_2 + 3X_3 - X_4$ 08
 $X_1 + 2X_2 + 3X_3 = 15$, $2X_1 + X_2 + 5X_3 = 20$, $X_1 + 2X_2 + X_3 + X_4 = 10$, $X_1, X_2, X_3, X_4 \geq 0$

Q. 4.

- a) Find inverse Z transform of $F(z) = \frac{1}{(z-2)(z-3)}$ for i) $|z| < 2$, ii) $|z| > 3$. 06
- b) A certain drug administered to 12 patients resulted in the following change in their blood pressure. 5, 2, 8, -1, 3, 0, 6, -2, 1, 0, 4, 5 Can we conclude that the drug increases the blood pressure? 06

- c) Find all possible Laurent's series expansions of the function $f(z) = \frac{1}{(z+1)(z-2)}$ about $z = 0$ indicating the region of convergence in each case. 08

Q. 5.

- a) Determine all basic solutions to the following problem 06
 Max = $x_1 - 2x_2 + 4x_3$,
 $x_1 + 2x_2 + 3x_3 = 7$, $3x_1 + 4x_2 + 6x_3 = 15$, $x_1, x_2, x_3 \geq 0$.
- b) If X is a Normal variate with mean 10 & s.d. 4, find i) $P(5 \leq X \leq 18)$, ii) $P(X \leq 12)$. 06
- c) Solve the NLPP 08
 Optimize $Z = 12x_1 + 8x_2 + 6x_3 - x_1^2 - x_2^2 - x_3^2 - 23$
 Subject to $x_1 + x_2 + x_3 = 10$, $x_1, x_2, x_3 \geq 0$.

Q. 6.

- a) Show that the given matrix is diagonalizable and hence find diagonal form and transforming matrix where $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$. 06
- b) Based on the following data if there is a relation between literacy and smoking. 06

	Smoking	Non-smoking
Literacy	83	57
Illiteracy	45	68

- c) Max. $Z = 12x_1x_2 + 2x_1^2 - 7x_2^2$, Subject to $2x_1 + 5x_2 \leq 98$, $x_1, x_2 \geq 0$ by K-T condition. 08

Duration: 3hrs

[Max Marks:80]

- N.B. :** (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]
- a Explain the minimum mode of 8086
 - b Explain in brief cache organization of Pentium processor
 - c Write an assembly language program for 8086 to exchange contents of two memory blocks
 - d Explain the following instructions: XOR, NOP related to 8086.
 - e Discuss in brief the Segment Register of 80386DX
- 2 a Explain the implementation of Paging in Protected mode of 80386. [10]
- b Explain the modes of 8255 with proper diagram of each modes [10]
- 3 a Design 8086 microprocessor-based on following Specifications: [10]
- 1. MP 8086 working at 10MHz minimum mode.
 - 2. 16 KB DRAM using 4 KB Devices
 - 3. 32 KB SRAM using 8KB chips
- b Explain what is ISR? How does 8086 decide the priority of interrupts? [10]
- 4 a Interface Interrupt controller 8259 with 8086 Microprocessor and modes of 8259. [10]
- b Write an ALP for 8086 to reverse a string of 10 characters. [10]
- 5 a Differentiate between Memory Mapped I/O and I/O mapped I/O. Explain in brief address decoding Techniques [10]
- b Explain MESI protocol [10]
- 6 a Draw the timing diagrams for Read and Write operations in minimum and maximum mode [10]
- b Explain hyper threading technology and its use in Pentium 4 [10]
