

**Fourth Semester B. Tech. (Computer Science and Engineering /
Artificial Intelligence and Machine Learning) Examination**

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours]

[Max. Marks : 60

Instructions to Candidates :—

- (1) Assume suitable data wherever necessary.
- (2) All questions carry marks as indicated.

1. (a) Solve the below recurrence relation using substitution method :
 $T(n) = T(n/2) + T(n/3) + n$ 5(CO1)
- (b) State and explain the necessity of amortized analysis. Illustrate the process with the help of binary counter. 5(CO1)
2. (a) Draw and split merge tree for the given sequences. Write algorithm for recursive merge sort. How merge sort is different from quick sort ?
39, 9, 81, 45, 90, 27, 72, 18, 72, 50. 4(CO2)
- (b) Multiply the given matrices A and B using Strassen's matrix multiplication algorithm :

$$\begin{array}{cccc} & 2 & 3 & 1 & 6 \\ A = & 3 & 1 & 5 & 0 \\ & 4 & 6 & 2 & 1 \\ & 1 & 5 & 2 & 6 \end{array} \quad \begin{array}{cccc} & 2 & 1 & 3 & 4 \\ B = & 1 & 3 & 1 & 2 \\ & 1 & 0 & 2 & 1 \\ & 1 & 4 & 3 & 2 \end{array} \quad 6(CO2)$$

3. (a) A knapsack can carry weights not exceeding 100. The weights and profits of six objects are as follows :

Wi	10	20	30	40	50	60
Pi	23	34	66	20	10	15

Solve the above problem using Greedy approach based on profit, weight and profit to weight ratio and find out the maximum profit that can be earned. 5(CO2)

- (b) What is Huffman encoding scheme ? How it is beneficial in generating codes for alphabetic data set ? Use the method to derive the Huffman tree for following data set :

Char	A	B	C	D	E
Freq	12	5	15	22	9

5(CO2)

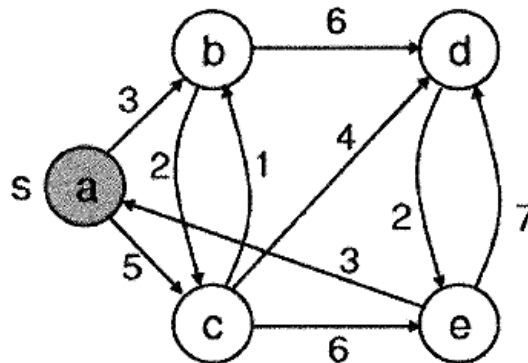
4. (a) Find optimal solution for the given sequences. Also find the length of Longest common subsequences.

String 1 : S U B S E Q U E N C E

String 2 : U S A M E N I C E

5(CO3)

- (b) Using all pairs shortest path algorithm find the length of shortest path from all vertices to all other vertices of the given graph.



5(CO3)

5. (a) Formulate at least two solutions for the 8 Queen's problems using backtracking. What the constraint applicable to solve the problems ? 5(CO3)

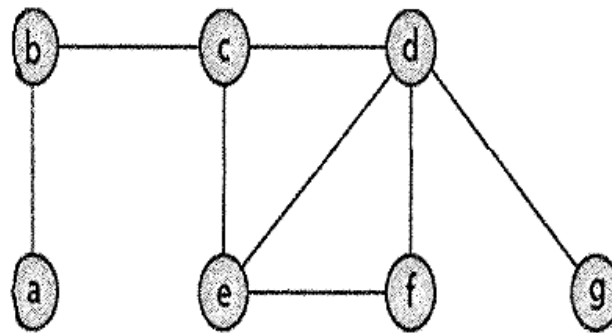
- (b) Specify the bounding condition of sum of subset problem solved using Backtracking. Apply backtracking procedure to obtain a sum (M) from the subset of set given.

Given Set $X = \{5, 10, 12, 13, 15, 18\}$

$M = 30$.

5(CO3)

6. (a) Clearly define the polynomial reduction process. Define NP complete and NP hard problem with the help of polynomial reduction. Give an example.
6(CO4)
- (b) Discuss vertex cover problem. Find the minimum size vertex cover in given graph.



4(CO4)

