CBCS Scheme

USN ☐☐☐☐☐☐☐☐☐☐   **16MCA33**

Third Semester MCA Degree Examination, June/July 2018
Analysis and Design of Algorithms

Time: 3 hrs.   Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

1. a. Explain various steps in fundamentals of algorithmic problem solving. **(10 Marks)**
   b. List out important problem types in the study of algorithms. Explain any two of them. **(06 Marks)**

OR

2. a. Discuss various asymptotic notations. **(06 Marks)**
   b. Write an algorithm for solving tower of Hanoi problem. Find its time complexity. **(10 Marks)**

Module-2

3. a. Write an algorithm to sort given set of numbers using selection sort. Analyze this algorithm. **(08 Marks)**
   b. Discuss brute force string matching algorithm. Compute best and worst case time complexities. **(08 Marks)**

OR

4. a. Briefly explain divide-and-conquer strategy. **(02 Marks)**
   b. Apply merge sort on the array: P, r, o, G, R, a, M, m, i, N, g. **(04 Marks)**
   c. Discuss the concept of multiplication of large integers. Apply this algorithm to multiply 25 and 64. Find the time complexity. **(10 Marks)**

Module-3

5. a. Write an algorithm to traverse the graph using DFS method. Traverse the graph given in Fig.Q5(a) starting from the node D. Construct appropriate DFS tree.
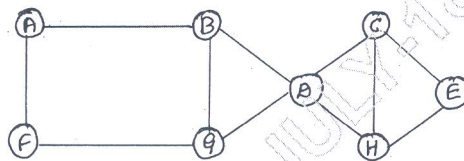

Fig.Q5(a)   **(10 Marks)**

   b. Briefly discuss the Johnson-Trotter algorithm to find permutations. Apply this algorithm for n = 3. **(06 Marks)**

OR

6. a. Write Prim's algorithm for finding minimum spanning tree of a graph. Find the minimum spanning tree for the Fig.Q6(a) using Prim's algorithm.
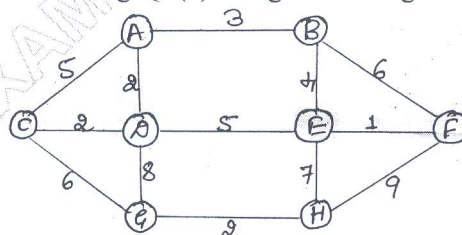

Fig.Q6(a)   **(08 Marks)**

b. Discuss Huffman's algorithm for encoding and decoding. Following is the list of characters and their probability of occurrences. Construct a Huffman tree. Encode the text ABACABAD. Decode the code 100010111001010. **(08 Marks)**

Character	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15

Module-4

7 a. Explain sorting by counting with suitable algorithm. Trace the algorithm to sort the numbers given here: 25, 42, −4, 56, 0, 10, 31. **(08 Marks)**

b. Discuss the concept of hashing. With suitable examples, explain the methods for resolving hash collisions. **(08 Marks)**

OR

8 a. Give Floyd's algorithm for solving all-pair-shortest-path problem. Apply the same on a graph given below:
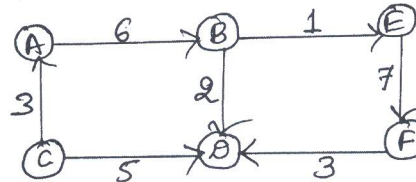

Fig.Q8(a) **(08 Marks)**

b. Explain 0/1 knapsack problem. Solve the following knapsack to find maximum profit. Using dynamic programming technique.

Item	Weight	Value
1	3	25
2	1	20
3	2	40

Capacity of knapsack, W = 4. **(08 Marks)**

Module-5

9 a. Write a note on decision trees. **(04 Marks)**

b. Draw a decision tree for finding minimum of three numbers. **(04 Marks)**

c. Discuss P, NP and NP − complete problems. **(08 Marks)**

OR

10 a. Discuss n-Queen's problem. Draw a state-space tree to solve n-Queen's problem for n = 4. **(08 Marks)**

b. Solve the following assignment problem using branch-and-bound technique, with suitable state-space tree.

$$
\begin{array}{c}
\quad\ J_1\ \ J_2\ \ J_3\ \ J_4 \\
\begin{array}{c} a \\ b \\ c \\ d \end{array}
\begin{bmatrix}
9 & 2 & 7 & 8 \\
6 & 4 & 3 & 7 \\
5 & 8 & 1 & 8 \\
7 & 6 & 9 & 4
\end{bmatrix}
\end{array}
$$

(08 Marks)

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