CBCS SCHEME

USN | | | | | | | | | | |

18MCA33

Third Semester MCA Degree Examination, Aug./Sept. 2020
Design and Analysis of Algorithm

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define algorithm. Explain steps involved in algorithm design and analysis process with neat diagram. **(10 Marks)**

b. Discuss various asymptotic notations. **(06 Marks)**

c. List steps involved in analyzing the time efficiency of non-recursive algorithm. **(04 Marks)**

OR

2 a. Define the terms with examples,
(i) Weighted graph
(ii) Connected graph.
(iii) Ordered tree
(iv) Dictionary. **(08 Marks)**

b. Solve the recurrence relation and draw a tree of recursive calls for tower of Hanoi problem. **(07 Marks)**

c. Prove $3n^2 + 2n^2 = O(n^3)$ and $3^n != O(2^n)$. **(05 Marks)**

Module-2

3 a. Discuss best, worst and average case efficiencies in linear search. **(04 Marks)**

b. Using bubble sort algorithm arrange the letters of the word 'QUESTION' in alphabetical order. **(06 Marks)**

c. Write an algorithm for selection sort. If A is an array of size n, obtain an expression for the number of key comparisons. **(10 Marks)**

OR

4 a. Write and explain quick sort algorithm with example. Explain the programming technique used in this. **(10 Marks)**

b. 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 the pseudo code for insertion sort algorithm. Trace the algorithm for the following input:
89, 45, 68, 90, 29, 34, 17 **(10 Marks)**

b. Write an algorithm to traverse the graph using DFS method. Traverse the graph given in Fig. Q5 (b). Starting from the node D. Construct appropriate DFS tree. **(10 Marks)**

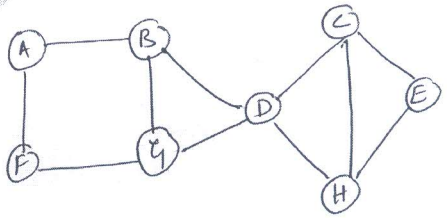

Fig. Q5 (b)

OR

6 a. Write Prim's algorithm and apply the same to find minimum cost spanning tree for the graph is Fig. Q6 (a). **(08 Marks)**

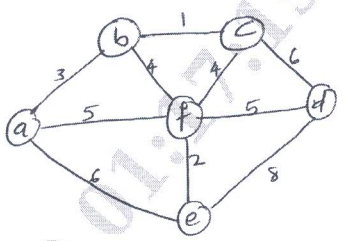

Fig. Q6 (a)

b. Apply Dijkstra's Algorithm for the graph in the Fig. Q6 (b). **(06 Marks)**

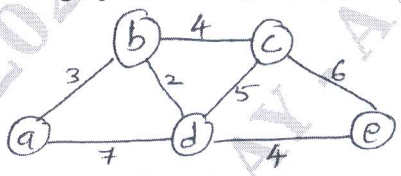

Fig. Q6 (b)

c. Construct a Huffman tree for the following data. Encode the text ABACABAD. Decode the code 100010111001010. **(06 Marks)**

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

Module-4

7 a. Write Horspool's string matching algorithm. Apply this to find the pattern "BARBER" in the text JIM SAW ME IN A BARBER SHOP. **(10 Marks)**

b. Write the algorithm for comparisons counting sort. Sort 13, 11, 12, 13, 12, 12 by distribution counting method. **(10 Marks)**

OR

8 a. Give Floyd's algorithm for solving all pair-shortest-path problem. Apply the same on graph in Fig. Q8 (a). **(10 Marks)**

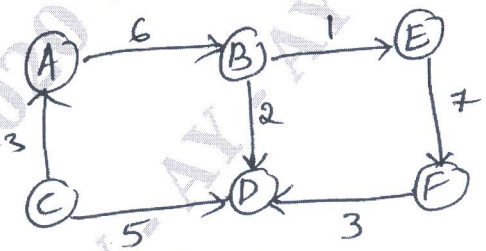

Fig. Q8 (a)

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

Item	Weight	Value
1	2	42
2	1	12
3	3	40
4	2	25

Capacity of Knapsack = W = 5. **(10 Marks)**

Module-5

9 a. Discuss P, NP and NP – complete problems. **(10 Marks)**

b. Write a note on decision trees. **(05 Marks)**

c. Draw a decision tree for finding minimum of three numbers. **(05 Marks)**

OR

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

b. Solve the following assignment problem using branch-and-bound technique, with suitable state-space tree. **(10 Marks)**

	J_1	J_2	J_3	J_4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

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