CBCS SCHEME

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17CS43

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Design and Analysis of Algorithms

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 asymptotic notations Big oh, Big omega and Big theta with example. **(08 Marks)**

b. List and explain the important problem types that are solved by computer. **(07 Marks)**

c. Prove that : If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then $t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$. **(05 Marks)**

OR

2 a. Design an algorithm for checking whether all elements in a given array are distinct or note. Derive its time complexity. **(08 Marks)**

b. Give general plan of analyzing recursive algorithm. Mathematically analyze the tower of hanoi problem and find its time efficiency. **(08 Marks)**

c. Compare the order of growth $\frac{1}{2}n(n-1)$ and n^2. **(04 Marks)**

Module-2

3 a. Explain divide and conquer method. Write the algorithm for binary search and derive its time complexity. **(10 Marks)**

b. List out the advantages and disadvantages of divide and conquer method. Illustrate the topological sorting algorithm for the graph in Fig Q3(b), using DFS method.

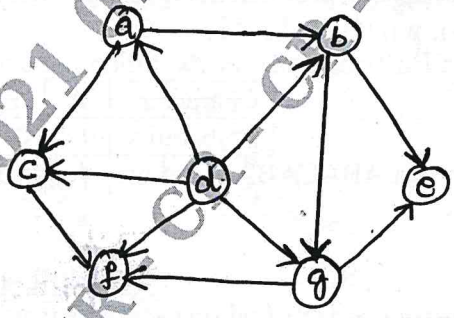

Fig Q3(b) **(10 Marks)**

OR

4 a. Apply Quicksort algorithm for the following list of elements 5, 3, 1, 9, 8, 2, 4, 7. **(08 Marks)**

b. Write algorithm for mergesort and Analyze its efficiency. **(08 Marks)**

c. Explain Strassen's matrix multiplication. **(04 Marks)**

Module-3

5 a. Write Dijkstras shortest path algorithm. Apply Dijkstras shortest path algorithm on Fig Q5(a) to obtain shortest path. Assume vertex 6 as source.

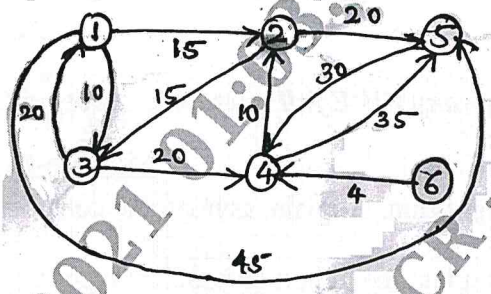

Fig Q5(a) **(10 Marks)**

b. Write an algorithm for the heapsort. Sort the given list of number using heapsort. Derive its time complexity: 100, 75, 80, 25, 50, 30, 45. **(10 Marks)**

OR

6 a. Define minimum spanning tree. Apply prims algorithm on the graph Fig Q6(a).

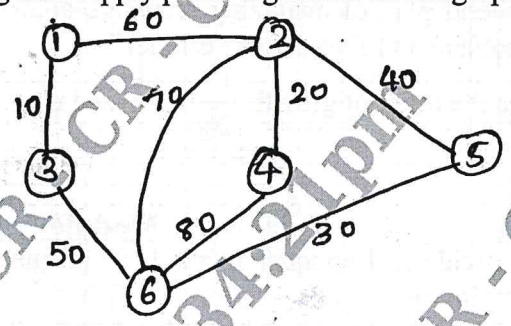

Fig Q6(a) **(08 Marks)**

b. Solve the knapsack problem using greedy method for n = 3, m = 20, $(P_1, P_2, P_3) = 25, 24, 15$ and $(w_1, w_2, w_3) = (18, 15, 10)$. **(04 Marks)**

c. Construct a Huffman code for the following data:

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

Encode the text ABACABAD and decode the encoded text 100010111001010. **(08 Marks)**

Module-4

7 a. Write the pseudocode to find on optimal Binary search tree by dynamic C programming. **(08 Marks)**

b. Write Bellman Ford algorithm to compute shortest path. **(05 Marks)**

c. Find the optimal solution for the following instance of knapsack problem using dynamic programming.

Item	Weight	Value
1	2	12
2	1	10
3	3	20
4	2	15

(07 Marks)

OR

8 a. Explain dynamic programming. Apply Warshalls algorithm to compute transitive closure for the graph in Fig 8(a).

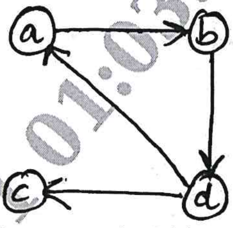

Fig 8(a) **(10 Marks)**

b. Write Floyd's algorithm. Find all pairs shortest path using Floyd's algorithm for the graph in Fig Q8(b).

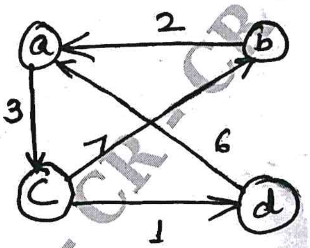

Fig 8(b) **(10 Marks)**

Module-5

9 a. With necessary state space diagram, explain the solving of four-queens problem by backtracking. **(10 Marks)**

b. What is branch and bound technique? How it is different from backtracking? **(05 Marks)**

c. Explain how the Travelling Salesman Problem (TSP) can be solved using branch and bound. **(05 Marks)**

OR

10 a. Apply Backtracking method to solve subset sum problem for the instance d = 15, s = {3, 5, 6, 7} **(08 Marks)**

b. Explain the classes of NP-hard and NP-complete. **(06 Marks)**

c. Draw portion of state space tree for m-colouring with n = 3 and m = 3 and explain m-colouring. **(06 Marks)**

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