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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Computer Science and Engineering

Semester End Examination; May / June - 2019

Analysis and Design of Algorithms

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. List and explain basic asymptotic notations with an example for each. 7

b. Write Bubble sort algorithm and analyze its efficiency. 7

c. Define an algorithm. What are the properties of an algorithm? 6

2 a. Give the general plan for the mathematical analysis of recursive algorithms. Write the algorithm for solving the Tower of Honoi problem and analyze its efficiency. 12

b. Define a Graph. List and explain different graph representation methods, considering the example of directed weighted graph. 8

UNIT – II

3 a. Write Binary search algorithm and analyze its efficiency in worst case. 8

b. Write Quick sort algorithm. Apply the same on the following set of elements: 5, 3, 1, 9, 8, 2, 4, 7 to sort the elements in ascending order and write the tree of recursive calls made. 12

4.a. Write merge sort algorithm and analyse its efficiency. 10

b. Define Topological sorting. Apply the source removal method and find the topological ordering of the graph is Fig. 4(b).

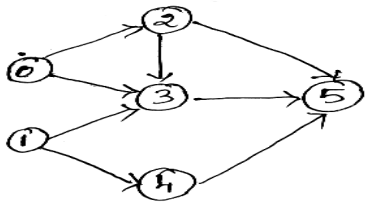

Fig 4 (b) 6

c. Differentiate between the DFS and BFS methods. 4

UNIT - III

5 a. Explain the concept of greedy technique for Prim's algorithm. Obtain the minimum cost spanning Tree for the graph in Fig. 5(a); by applying the Prim's algorithm.

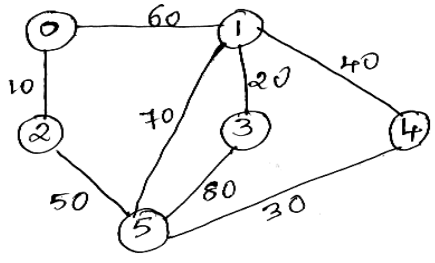

fig 5(a) 10

b. Write Huffman algorithm for constructing the Huffman code. Apply Huffman algorithm and construct the Huffman code for the following : 10

Character	A	B	C	D	E
Probability	0.35	0.1	0.2	0.2	0.15

i) Encode the text ABACABAD using the generated code

ii) Decode the text whose encoding is 10001011100101

Contd…2

6 a. Define Minimum Spanning Tree. Give high level description of Kruskal's algorithm to find MST and find the minimum spanning tree for the graph in Fig. 6(a). 12

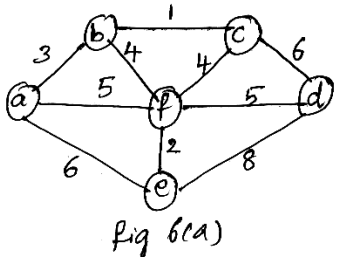

Fig 6(a)

b. Define a Heap. Construct a heap for the list 50, 25, 30, 75, 100, 45, 80 by successive insertion using top-down approach. 8

UNIT – IV

7 a. Define Transitive closure. Apply Warshall's algorithm to find transitive closure of the graph in Fig. 7(a). 8

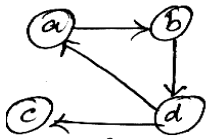

Fig 7(a)

b. Give the necessary recurrence relation used to solve 0/1 knapsack problem using dynamic programming. Apply it to solve the following instance and show the result $n = 4$, $m = 5$. 12

Profits	12	10	20	15
Weights	2	1	3	2

8 a. Using Floyd's algorithm solve the all pair shortest path problem for the graph whose weight matrix is given below: 10

$$\begin{bmatrix} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & \infty \\ \infty & 7 & 0 & 1 \\ 6 & \infty & \infty & 0 \end{bmatrix}$$

b. Solve the following TSP problem which is represented as a graph in Fig. (8b), using dynamic programming method to obtain the optimal tour. 10

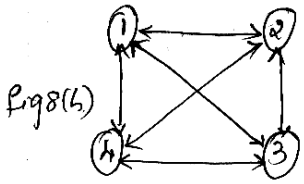

Fig 8(b)

$$\Rightarrow \begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

UNIT - V

9 a. With necessary state space diagram, explain the method of solving four queens problem by backtracking. 10

b. Explain LC Branch and Bound and FIFO Branch and Bound. 10

10 a. Explain the classes of NP-Hard and NP-complete problems. 10

b. For a given $n \times n$ cost matrix C of a job assignment problem find optimal solution using branch and bound method. Give the complete state space for the instance of assignment problem solved with best first branch and bound algorithm. 10

$$C = \begin{array}{c|cccc|l} & j_1 & j_2 & j_3 & j_4 & \\ \hline & 9 & 2 & 7 & 8 & \text{Person } a \\ & 6 & 4 & 3 & 7 & \text{Person } b \\ & 5 & 8 & 1 & 8 & \text{Person } c \\ & 7 & 6 & 9 & 4 & \text{Person } d \end{array}$$

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