

**U.G. 3rd Semester Examination-2021**

**COMPUTER SCIENCE**

**[HONOURS]**

**Course Code : COM.SC-H-CC-L-306**

**(Design and Analysis of Algorithms)**

Full Marks : 60 Time :  $2\frac{1}{2}$  Hours

*The figures in the right-hand margin indicate marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP-A**

1. Answer any **ten** of the following questions :

2×10=20

- a) What is the difference between algorithm and program?
- b) Define space complexity of an algorithm.
- c) What is the basic principal of divide and conquer method?
- d) Differentiate between top-down and bottom-up approach for algorithm designing.
- e) What is the difference between linear search and binary search?

- f) Write the worst case and best case running time of merge sort.
- g) State the fractional knapsack problem.
- h) What is backtracking?
- i) Does greedy method always give an optimal solution? Justify.
- j) What is matrix representation of graph?
- k) Give the example of an optimization problem whose solution space is finite.
- l) Define the travelling salesman problem (TSP).

**GROUP-B**

2. Answer any **four** of the following questions:

5×4=20

- a) Write down the working principle of binary search algorithm and derive the worst case time complexity of this algorithm. 2+3
- b) Write down the algorithm of quick sort. 5
- c) Use merge sort algorithm to sort the following array  
310, 285, 179, 652, 351, 423, 861, 254, 450, 520. 5

[Turn over]

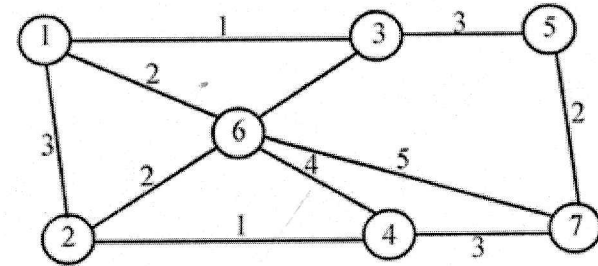
- d) Write four of dynamic programming paradigms and explain any one step among them. 2+3
- e) Explain the depth first search algorithm and write the time complexity of this algorithm. 4+1
- f) Define P-class and NP-class. What is the relation between them? 4+1

### GROUP-C

3. Answer any **two** of the following questions:  $10 \times 2 = 20$

- a) Explain the graph coloring problem. Find an optimal solution of the fractional knapsack problem for an instance with number of items 7, Capacity of the knapsack  $W=15$ , profit associated with the items  $(p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$  and weight associated with each item  $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$ . 4+6

- b) What is minimum spanning tree? Write down the Kruskal algorithm to find a minimum spanning tree. Apply it on the following graph and show each step. 2+4+4



- c) Explain asymptotic notations. Write down the Floyd-Warshall algorithm to solve the all pair shortest path problem. 5+5
- d) Write short note on following (any **two**): 5×2=10
- i) Breadth first search algorithm
  - ii) Ford-Fulkerson Algorithm
  - iii) Matrix-chain multiplication problem
  - iv) Heap sort