



# MANIPAL INSTITUTE OF TECHNOLOGY

## MANIPAL

A Constituent Institution of Manipal University

### V SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)

### MAKE UP EXAMINATIONS, DEC 2016

### SUBJECT: FUNDAMENTALS OF ALGORITHM ANALYSIS AND DESIGN (ICT 351)

(REVISED CREDIT SYSTEM)

(27/12/2016 )

TIME: 3 HOURS

MAX. MARKS: 50

#### Instructions to candidates:

- Answer **ANY FIVE FULL** the questions
- Missing data may be suitably assumed.

- |            |   |   |
|------------|---|---|
| <b>1A.</b> | Find MaxClique for the graph given in Figure Q.1A using Backtracking algorithm.   | 5 |
| <b>1B.</b> | Consider 3 items with profits [25,24,15], weights [18,15,10] and capacity of the knapsack as 30. Find the optimal packing of knapsack using Greedy technique with all the possible greedy criteria. | 3 |
| <b>1C.</b> | What is the Principle of optimality? Explain with an example.   | 2 |
| <b>2A.</b> | Find all pairs shortest paths for the graph given in Figure Q.2A using Dynamic programming technique.   | 5 |
| <b>2B.</b> | Perform average case time complexity analysis for Quick Sort.   | 3 |
| <b>2C.</b> | Compare Backtracking and Branch and Bound algorithm design techniques.  | 2 |
| <b>3A.</b> | Find the optimal tour for traveling salesperson using Branch and Bound technique for the graph shown in Figure Q.3A.  | 5 |
| <b>3B.</b> | Define Asymptotic notations $O$ , $\Omega$ , $\theta$ and prove that $\frac{1}{2}n(n-1) \in \theta(n^2)$  | 3 |
| <b>3C.</b> | What is P and NP-complete problems.   | 2 |
| <b>4A.</b> | Write Kruskal's and Prim's algorithms. Also specify Greedy criteria used.   | 5 |
| <b>4B.</b> | Using component labeling algorithm find the components in the graph given in Figure Q.4B.   | 3 |
| <b>4C.</b> | Arrange the following functions in the increasing order of growth.  | 2 |
|            | i) $\log(n!)$ ii) $n \log n$ iii) $\sqrt{\log n}$ iv) $(\log n)!$   |   |
| <b>5A.</b> | Using the Divide and Conquer strategy, write an algorithm for finding the closest pair of $n$ given points. Analyse the time complexity of the same.  | 5 |

- 5B.** Write a recursive algorithm for sequential search. Find the space and time complexity for the same. 3
- 5C.** Represent undirected weighted graph using an Abstract Data Type. 2
- 6A.** How performance of an algorithm is analyzed? Explain different ways analyzing time complexity with an example. 5
- 6B.** Justify that Machine scheduling is an optimization problem. Also write greedy criterion to solve the problem. 3
- 6C.** Write a recurrence relation for analyzing time complexity of binary search. Solve it using substitution method. 2

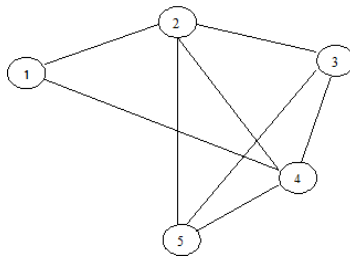


Figure Q.1A

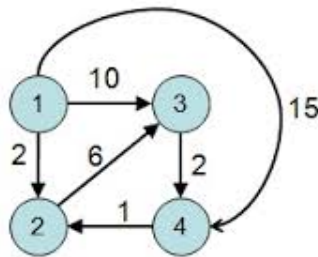


Figure Q.2A

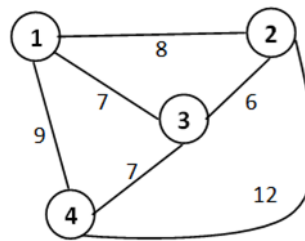


Figure Q.3A

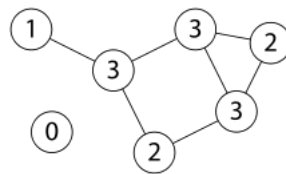


Figure Q.4B