

**BACHELOR OF COMPUTER APPLICATIONS  
(BCA) (Revised)**

**Term-End Examination**

**December, 2015**

**BCS-042 : INTRODUCTION TO ALGORITHM DESIGN**

*Time : 2 hours*

*Maximum Marks : 50*

**Note :** Question no. 1 is **compulsory**, carrying 20 marks.

Answer any **three** questions from the rest.

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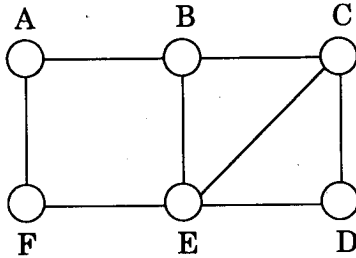
1. (a) Using the definition of  $\Omega$ , show that  $6n^2 + 20n \neq \Omega(n^3)$ . 4

(b) Given a list of  $n$  distinct integers. Write an algorithm to determine the position of an integer in the list using a linear search and count the number of comparison operations required. 6

(c) By applying induction method, show that for all positive integers  $n$

$$1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}. \quad 6$$

- (d) Illustrate the representation of the following graph through adjacency list and adjacency matrix : 4



2. (a) Find the optimal solution to the knapsack (fractional) problem  $n = 5$  and  $m = 10$ , where  $n$  is the number of objects and  $m$  is the capacity of knapsack. 6  
 Profit and weight of each object are given below :

$$(P_1, P_2, P_3, P_4, P_5) = (10, 30, 35, 20, 40)$$

$$(W_1, W_2, W_3, W_4, W_5) = (3, 5, 2, 6, 1).$$

- (b) Write Prim's algorithm to find the minimum cost spanning tree. 4
3. (a) Apply QuickSort to sort the following array. Show all the steps. 6

|    |   |    |   |   |   |    |    |
|----|---|----|---|---|---|----|----|
| 15 | 5 | 10 | 8 | 7 | 2 | 20 | 30 |
|----|---|----|---|---|---|----|----|

- (b) What are the worst case and best case in QuickSort algorithm ? 4

4. Define the following terms :

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- (a) Optimization
- (b) Dynamic programming
- (c) Recurrence relation
- (d) Asymptotic bounds
- (e) Unconnected graph

5. For the given graph, apply DFS traversal scheme and write DFS sequence. Also write the time complexity of DFS and BFS algorithms.

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