No. of Printed Pages : 4

BCS-042

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)

03880

Term-End Examination

December, 2017

BCS-042 : INTRODUCTION TO ALGORITHM DESIGN

Time : 2 hours *Maximum Marks : 50*

Note : *Question no. 1 is* ***compulsory****. Answer any* ***three*** *questions from the rest.*

1. (a) Arrange the following functions in increasing order of growth rates : 2

(i) $O(\log n)$

(ii) $O(n^3)$

(iii) $O(5^n)$

(iv) $O(n \log n)$

(b) What is an Algorithm ? Briefly explain the meaning of complexity of an algorithm. 5

(c) Define O (big oh) notation. Prove or disprove the following : 5

$$2n^2 + 3n + 1 = O(n^2)$$

(d) Write a binary search algorithm and analyse its time complexity in best case and in worst case. 5

(e) Create an adjacency matrix for the following graph : 3

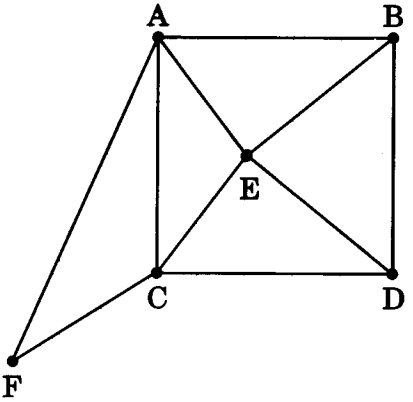

Figure 1

2. (a) Write an algorithm for Depth-First Search (DFS) and traverse the following graph using DFS : (Starting vertex is A) 7

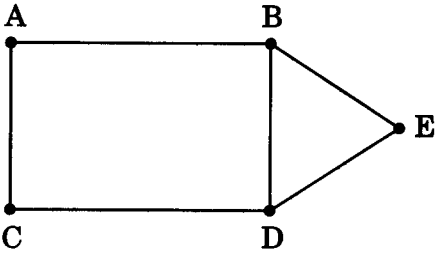

Figure 2

(b) Explain the difference between directed and undirected graphs. 3

3. (a) Apply the Quick-sort algorithm to sort the following list : 5

5, 9, 8, 4, 2, 15, 6

(b) Find the minimum cost spanning tree from the following graph using Kruskal's algorithm : 5

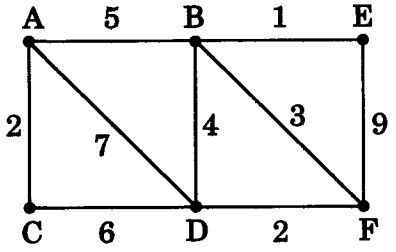

Figure 3

4. (a) By using mathematical induction, prove that

$$P(n) = 1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}.$$

5

(b) Consider the following fractional Knapsack problem :

M = 15 and

$(P_1, P_2, P_3) = (25, 24, 15)$ and

$(W_1, W_2, W_3) = (18, 15, 10)$

Show the running of the greedy algorithm for the fractional Knapsack problem. 5

5. Explain the following terms with examples : *10*

(a) Combinatorial Problem

(b) Complete Graph

(c) Backtracking

(d) Asymptotic Notations