No. of Printed Pages : 4

BCS-042

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)

00063

Term-End Examination

December, 2018

BCS-042 : INTRODUCTION TO ALGORITHM DESIGN

Time : 2 hours *Maximum Marks : 50*

Note : *Question no. 1 is* ***compulsory*** *and carries 20 marks. Answer any* ***three*** *questions from the rest.*

1. (a) Define Ω (Big 'Omega') notation. By using basic definition of Ω show that

$$f(n) = \Omega(g(n)),$$

where $f(n) = 2n^3 + 3n^2 + 1$, and

$$g(n) = 2n^2 + 3.$$ *4*

(b) What is an algorithm ? Explain the meaning of time complexity and space complexity of an algorithm. *6*

(c) Arrange the following functions in increasing order of growth

n^3, $2n^2 + 3$, $5n + 2$, 5^n, 2^n. 3

(d) Define the following terms : 4

(i) Spanning tree

(ii) Adjacency matrix

(e) Find the time complexity of the following loop : 3

```
for (i = 1; i <= n; i ++)
    {
       i = i * 2;
    }
```

2. (a) Write algorithm to multiply two square matrices of order n × n and find its time complexity. 5

(b) Using Insertion sort, sort the following list and show all the intermediate steps : 5

8 6 4 15 9 25 2

3. (a) Find the optimal solution to the knapsack instance n = 5, capacity M = 15,

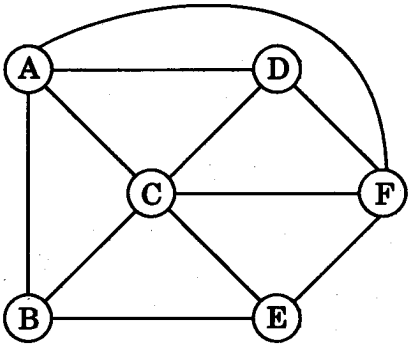
$(p_1, p_2, ..., p_5) = (15, 35, 48, 30, 40)$

$(w_1, w_2, ..., w_5) = (4, 8, 5, 6, 2)$. 7

(b) Prove that

$P(n) : 1^2 + 2^2 + ... n^2 = \frac{n(n+1)(2n+1)}{6}$, by using mathematical induction. 3

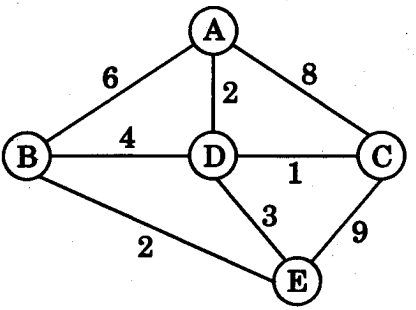
4. (a) Write pseudo code for Breadth-First Search (BFS). Traverse the following graph using BFS, the starting node is A. 7



(b) Solve the following recurrence relation using recursion tree method : 3

$$T(n) = 4T\left(\frac{n}{2}\right) + n$$

5. (a) Write Kruskal's Algorithm to find Minimum Cost Spanning Tree (MCST) of the following graph : 6



(b) Write an algorithm to search an element (say x) using Binary Search. Analyze its time complexity in worst case. 4