04292

No. of Printed Pages : 4

**BCS-042**

# BACHELOR OF COMPUTER APPLICATIONS

## (BCA) (Revised)

## Term-End Examination, 2019

## BCS-042 : INTRODUCTION TO ALGORITHM DESIGN

**Time : 2 Hours]** **[Maximum Marks : 50**

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



1. (a) Arrange the following functions in increasing growth order : [2]

   (i) $0(n^2)$

   (ii) $0(\log n)$

   (iii) $0(2^n)$

   (iv) $0(n \log n)$

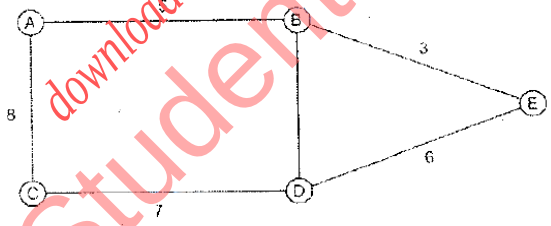
   (b) Define $\theta$ (Theta) Notation. Let $f(n)$ and $g(n)$ are two Positive Functions. Prove or Disprove the following : [5]

   (i) $f(n) + g(n) = \theta(\min\{f(n), g(n)\})$

(ii) $3n^2 + 5 = \theta(n^2)$

(c) Write Prim's Algorithm to solve the Minimum cost spanning tree (MCST) problem. Analyze the time complexity of the algorithm also. Apply Prim's Algorithm for the following graph and find the Minimum Cost of the Spanning tree. [7]

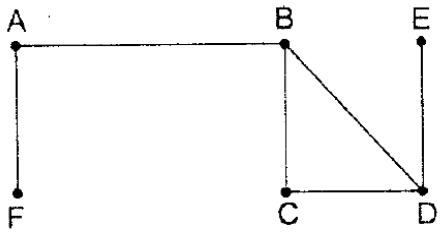
(Starting Vertex 'A')




(d) Apply Recursion Tree Method to find the asymptotic upper bound for the following

Recurrence : $T(n) = 2T\left(\frac{n}{2}\right) + n$ [4]

(e) Create Adjecency list for following graph : [2]



2. (a) Find the optimal solution to Knapsack (fractional) problem x = 5 and M = 10, where x is the number of objects and M is the capacity of Kanpsack. Profit and weight of each object are given below : [6]

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

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

(b) Multiply 2432 × 5219 using Divide and Conquer Method(use Karatsaba Method). [4]

3. (a) Apply PARTITION procedure of QUICKSORT for the following array to find the final position of the last element 9 (Pivat element). Show all the intermediate steps. [5]

| 2 | 10 | 15 | 7 | 6 | 20 | 9 |
|---|---|---|---|---|---|---|

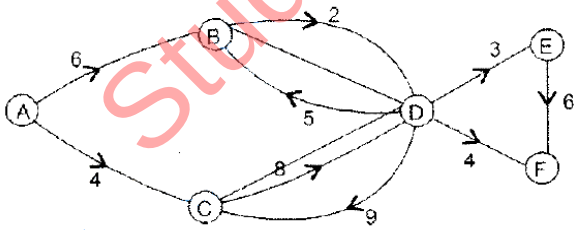
(b) Write DFS algorithm and find its time complexity. [5]

4. (a) Find the complexity of the following code : [3]

```
for (i = 1; i < = nj i++)
{ for (j = 1; j < = n jj++)
```

```
{
        if A [ j ] > B [ i ]
        Print A [ j ];
}
}
```

(b) Explain the concept of RELAXING an edge in Dijkstra's Algorithm. Apply Dijkstra's Algorithm to find the shortest path for the following graph. (Starting Vertex is 'A') [7]




5. (a) Write an algorithm to search an element (Say x) Using Binary Search. Analyze the time complexity of the algorithm in Worst Case. [5]

(b) Discuss all the three cases of Master Method to solve the Recurrence T (n) = $aT\left(\frac{n}{b}\right) + f(n)$

Where a $\geq 1$, b > 1. [5]

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