BCS-042

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)

Term-End Examination

December, 2022

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 Θ (big theta) notation. By using a basic definition, show that

$$7n^2 + 8n - 9 = \Theta(n^2).$$ *4*

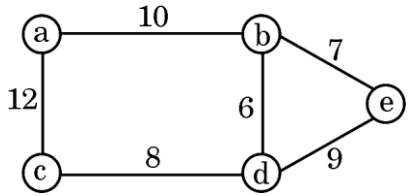
(b) Apply Bubble sort algorithm to sort the following list of numbers. Show the procedure step-by-step. Calculate the number of exchange and comparison operations required in the algorithm : *4*

15	8	7	11	25	13	12	4

(c) Solve the following recurrence problem using recursion tree method : *6*

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

(d) Draw any three spanning trees of the following weighted connected graph : *6*



2. (a) Give an example for each complexity class : *3*

$O(n)$, $O(n^2)$, $O(n \log n)$

(b) (i) Write the Euclid algorithm to compute GCD of two non-negative integers and apply it to find GCD(325, 95). Show all the intermediate steps. *4*

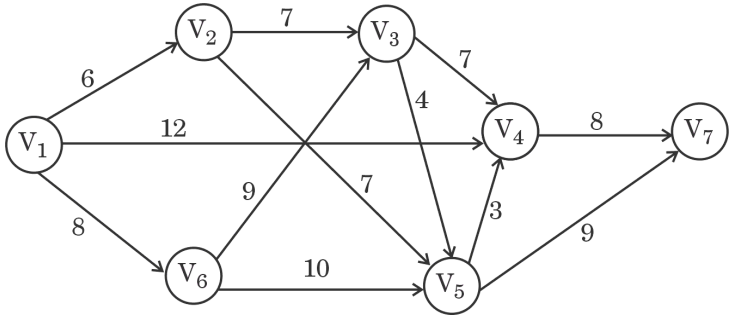
(ii) Perform the complexity analysis of the above algorithm. *3*

3. (a) Compare between Kruskal's and Prim's algorithms. *3*

(b) Apply Strassen's algorithm to multiply two matrices $A(4 \times 4)$ and $B(4 \times 4)$ using divide and conquer technique and explain. *7*

4. (a) Define the term Branch and Bound and write the problem which can be solved through this technique. *3*

(b) Apply Dijkstra's algorithm to find the shortest path from V_1 to all other nodes. Show all the intermediate steps and explain. *7*



5. (a) Define the terms : path, cycle and a complete graph. *3*

(b) Write a program to generate Fibonacci series of 10 terms and count

(i) the number of times the loop will continue, and

(ii) the number of times the assignment operations will occur. *7*