

**BACHELOR OF COMPUTER
APPLICATIONS (BCA)**

Term-End Examination

June, 2024

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

Time : 2 Hours

Maximum Marks : 50

Note : (i) *Question No. 1 is compulsory and carries
20 marks.*

(ii) *Answer any **three** questions from the
rest.*

1. (a) Arrange the following time complexities in
the increasing order : 2

$\log n, O(n^2), O(3^n), n!$

(b) Write the names of the following
symbols : 3

(i) Ω

(ii) θ

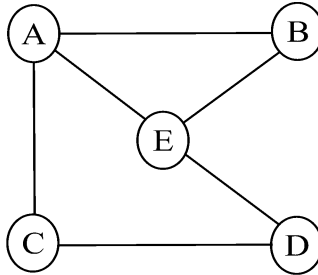
(iii) O

- (c) What is recurrence relation ? Define Fibonacci sequence using recurrence relation. 4
- (d) What is linear search method ? Apply linear search to search the number 9 in the following list of numbers. Show the searching steps : 6

8, 4, 10, 6, 9, 2

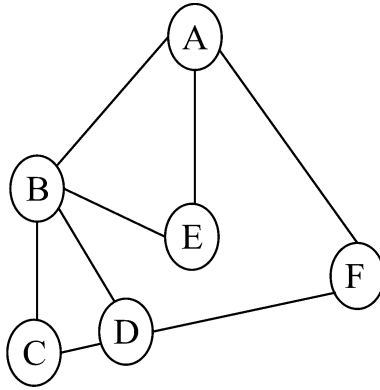
Also, analyse the worst case complexity of the linear search method.

- (e) Write adjacency-list and adjacency-matrix representation of the following graph : 5



2. (a) Explain the following terms : 3
- (i) Space complexity
 - (ii) Cycle in a graph
 - (iii) Lower bound

- (b) Traverse the following graph using DFS-method, taking A as a starting vertex and sequence of vertices in the order of their appearance in traversal : 7



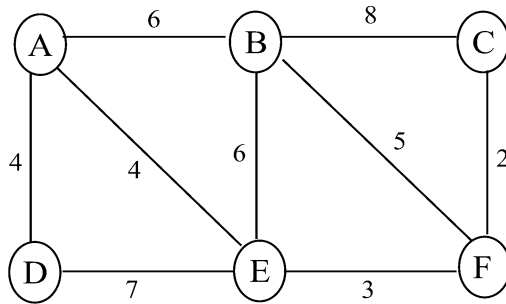
Also, write the time complexity of DFS method.

3. (a) Write and explain binary search algorithm. Explain its time complexity for best and worst cases. 5
- (b) Prove the following propositions using mathematical induction : 5

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

4. (a) Define the term algorithm. Explain various properties of an algorithm. 4

- (b) Write an algorithm for multiplying two matrices. Also find the time complexity of this algorithm. 6
5. (a) Write Kruskal's algorithm for finding minimum cost spanning tree (MCST). Apply this algorithm on the following graph to find MCST : 8



- (b) Briefly explain divide and conquer approach of problem solving. 2