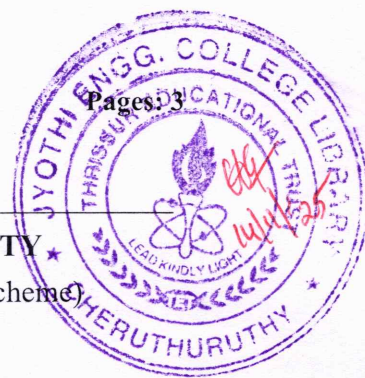


Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech Degree S7 (R,S) Examination November 2025 (2019 Scheme)

**Course Code: RAT401****Course Name: ALGORITHMS AND DATA STRUCTURES****Max. Marks: 100****Duration: 3 Hours****PART A***Answer all questions, each carries 3 marks.*

Marks

- |    |                                                                                                   |     |
|----|---------------------------------------------------------------------------------------------------|-----|
| 1  | Differentiate between primitive and non-primitive data structures.                                | (3) |
| 2  | Explain the recurrence relation with the help of an example.                                      | (3) |
| 3  | Represent the polynomial $P(X,Y) : 10X^7Y^7 + 5X^6Y^5 + 4X^4Y^2 + 8X^2 + 25$ array of structures. | (3) |
| 4  | Distinguish between linked lists and arrays. Mention their relative advantages and disadvantages. | (3) |
| 5  | Differentiate between strongly connected and weakly connected graph with example.                 | (3) |
| 6  | Differentiate between complete binary tree and full binary tree with suitable example.            | (3) |
| 7  | Explain the differences between linear search and binary search.                                  | (3) |
| 8  | What do you mean by Double Hashing? Explain with an example.                                      | (3) |
| 9  | Explain the concept of backtracking.                                                              | (3) |
| 10 | Describe the concept of NP complete problem                                                       | (3) |

**PART B***Answer any one full question from each module, each carries 14 marks.***Module I**

- |    |                                                                                                                          |     |
|----|--------------------------------------------------------------------------------------------------------------------------|-----|
| 11 | a) Explain any three asymptotic notations used to express the complexity of algorithm with the help of suitable examples | (9) |
|    | b) Explain the detailed classification of data structure?                                                                | (5) |

**OR**

- |    |                                                                  |     |
|----|------------------------------------------------------------------|-----|
| 12 | a) Solve the below recurrence relation using substitution method | (7) |
|----|------------------------------------------------------------------|-----|

$$T(n) = \begin{cases} 1 & \text{if } n = 1 \\ T(n-1) + 1 & \text{Otherwise} \end{cases}$$

- |    |                                                                           |     |
|----|---------------------------------------------------------------------------|-----|
| b) | With necessary examples, explain different types of recursive algorithms. | (7) |
|----|---------------------------------------------------------------------------|-----|

**Module II**

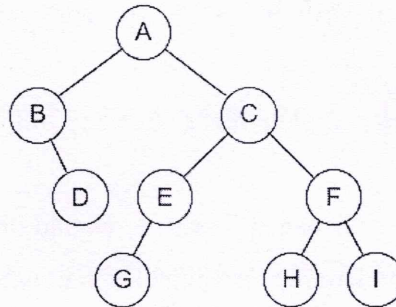
- 13 a) Design algorithm to perform push and pop operation on stack using array. (6)  
 b) Write an algorithm to convert an infix expression into its equivalent postfix expression. Convert the expression  $(A/(B-D+E))*(F-G)*H$  to postfix form' (8)  
 Show each step in the conversion including the stack contents.

**OR**

- 14 a) Design algorithms to perform following operations on a singly linked list with a header node. (6)  
 i) Insert a node at the beginning.  
 ii) Delete a node at the end.  
 b) Illustrate with examples different types of queue. (8)

**Module III**

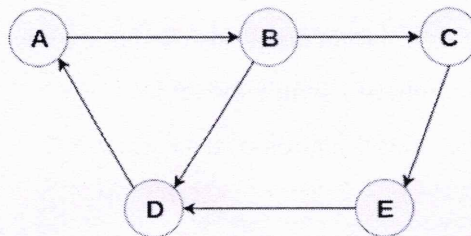
- 15 a) Write recursive algorithms for in order, preorder and post order traversals of a binary tree. Also, find all the traversals for the given tree. (9)



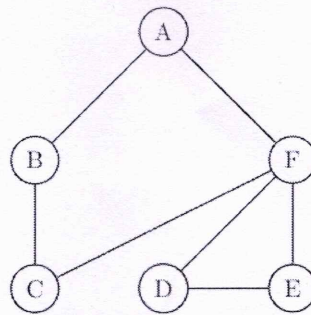
- b) Illustrate binary search tree with an example. (5)

**OR**

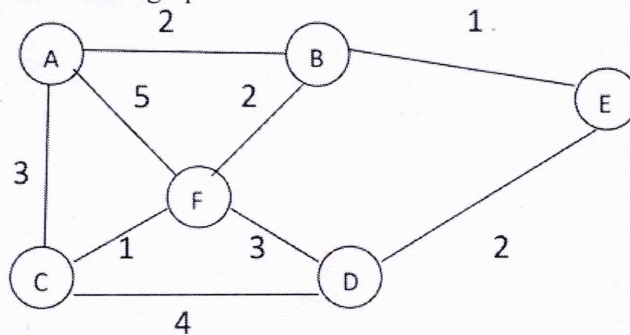
- 16 a) Express the adjacency matrix and the adjacency list representation of the graph. (6)



- b) Write Breadth First Search algorithm and illustrate it on the below graph. (8)

**Module IV**

- 17 a) Apply Dijkstra's algorithm to find the shortest path from vertex 'A' to all other vertices in the graph. (7)



- b) Design algorithm to perform insertion sort. Perform insertion sort on 34, 8, 14, 61, 4, 53, 81, 47 (7)

**OR**

- 18 a) What is the meaning of collision in hashing? Explain collision resolution techniques in context of hashing. (8)
- b) The Keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function  $h(k) = k \bmod 10$  and linear probing. What is the resultant hash table? (6)

**Module V**

- 19 a) Explain dynamic programming in detail with example. (7)
- b) Explain divide and conquer approach in detail with example. (7)

**OR**

- 20 a) Describe greedy approach with suitable example. (7)
- b) Explain branch and bound technique. (7)

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