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**Question Paper Code:R3802**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Information Technology

R21UIT302 – DATA STRUCTURES

(Common to CSE, CSD, AI&DS, AIML, CYBER and IOT Engineering Branches)

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 2 = 20 Marks)

1. What type of memory allocation is referred for Linked lists? CO1-U
2. Write down the operations that can be done with Stack data structure. CO1-U
3. Differentiate between a max heap and a min heap. CO1-U
4. Write some applications of graph. CO1-U
5. What do you mean by rehashing? CO1-U
6. Compare linked list and linear array and contrast which one will you prefer to use and when? Justify your answer. CO2-App
7. Evaluate the given Postfix Expression: 3 4 \* 2 5 \* + CO2-App
8. Construct the Expression tree for the following expression  
 $3 + ((5+9)*2)$  CO2-App
9. Draw a complete undirected graph having five nodes and find out the degree of each node. CO2-App
10. Which sorting algorithm is easily adaptable to singly linked lists? Why justify your answer? CO3-Ana

PART – B (5 x 16= 80 Marks)

11. (a) Write the coding for singly linked list for the following operations: CO2 -App (16)
- a) Creation of a list
  - b) Insertion of a node
  - c) Deletion of a node
  - c) Display the inserted data
  - d) Find the length of the data
- and also explain the performance of the operation with neat diagrammatic representation

Or

- (b) A circular queue has a size of 5 and has 3 elements 10,20 and 40 where  $F=2$  and  $R=4$ . After inserting 50 and 60, what is the value of  $F$  and  $R$ . Trying to insert 30 at this stage what happens? Delete 2 elements from the queue and insert 70, 80 & 90. Assess the sequence of steps with necessary diagrams with the value of  $F$  &  $R$ . CO2 -App (16)

12. (a) Convert the following infix expression into postfix using the algorithm  $(A-(B/C+(D/E*F)/G)*H)$  CO2 -App (16)

Or

- (b) Write a C program to perform insert, delete and display operations on queue ADT using array for the following elements: 20,40,60,80,100. Explain in detail with neat diagrammatical representation CO2 -App (16)

13. (a) Construct an AVL tree with detailed rotation, check balance factor for each node insertion and also write the Routine for all the rotations 150, 155, 160, 115, 110, 140, 120, 145, 130, 147, 170, 180. CO2 -App (16)

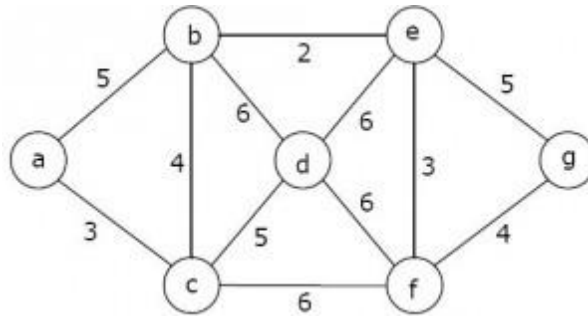
Or

- (b) Construct the expression tree for  $a*(b+c) + ((d+e*f)*g)$  CO2 -App (16)  
And explain in detail about. Discuss its advantages over the other evaluation techniques

14. (a) Explain about Shortest path algorithm in detail. Illustrate with an example and neat diagrammatical representation step by step explanation CO2 -App (16)

Or

- (b) Apply Prim's algorithm to find the minimum spanning tree for the following graph and explain each step in detail with neat diagrammatical representation CO2 -App (16)



15. (a) Write a routine to perform the sort of an array of numbers in descending order using insertion sort. and then show the iterations of the sorting process 42, 34, 75, 23, 21, 18, 90, 67, 78 Explain each Step in detail with neat diagrammatical representation CO2 -App (16)

Or

- (b) Explain the following with example CO2 -App (16)
- i. Hashing (4)
  - ii. Hash function (4)
  - iii. Hash Table (3)
  - iv. Bucket overflow (5)

