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**Question Paper Code: U3802**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Third Semester

Computer Science Engineering

21UIT302 - DATA STRUCTURES

(Common to IT, CSD , AI&DS & CSE(AI&ML) Engineering branches)

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

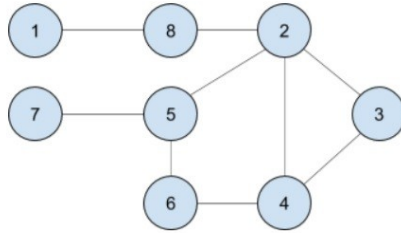
1. Consider the following definition in c programming language. Which of the following c code is used to create new node? CO1- U  

```
struct node
{
int data;
struct node * next;
}
typedef struct node NODE;
NODE *ptr;
```

(a) ptr=(NODE\*)malloc(sizeof(NODE));      (b)ptr=(NODE\*)malloc(NODE);  
(c) ptr=(NODE\*)malloc(sizeof(NODE\*));      (d)ptr=(NODE)malloc(sizeof(NODE));
2. How many stacks are needed to implement a queue? CO1- U  
(a) 1                                      (b) 2                                      (c) 3                                      (d) 4
3. Select one FALSE statement about binary trees: CO1- U  
(a) Every binary tree has at least one node.  
(b) Every non-empty tree has exactly one root node.  
(c) Every node has at most two children.  
(d) Every non-root node has exactly one parent.

4. Find the output of Depth First Traversal for the graph given below considering vertex 1 as the source vertex.

CO2- App



- (a) 1-8-2-5-7-6-4-3  
 (b) 1-8-2-3-4-6-5-7  
 (c) both (a) & (b)  
 (d) None of the above
5. The given array is arr = {1, 2, 4, 3}. Bubble sort is used to sort the array elements. How much iteration will be done to sort the array?
- (a) 4                      (b) 2                      (c) 1                      (d) 0

CO2- App

PART – B (5 x 3= 15Marks)

6. Mention the routine and also give pictorial representation for creation of a node linked list. CO1- U
7. The result of evaluating the postfix expression 5 4 6 + \*4 9 3 / + \* is 350. Find out the corresponding infix expression. CO2-App
8. How many binary trees are possible with four nodes? CO1- U
9. Differentiate DFS and BFS. CO1- U
10. Find the number of iterations necessary to sort the given numbers using the selection sort {44, 12, 7, 55}. CO2-App

PART – C (5 x 16= 80 Marks)

11. (a) Given a list 10,20,30,40 generalize the steps along with the routine and pictorial representation to insert a node from the beginning of the linked list, deletion of last node in the list, searching the second node in a list and traversing the whole list. CO2- App (16)
- Or
- (b) Given two polynomial expressions represented by linked lists. You need to write a function that adds these lists, that is, adds the coefficients that have the same variable powers. CO2- App (16)
- $4X^4+3X^3+X+5,$   
 $3X^3+2X^2+X+3.$

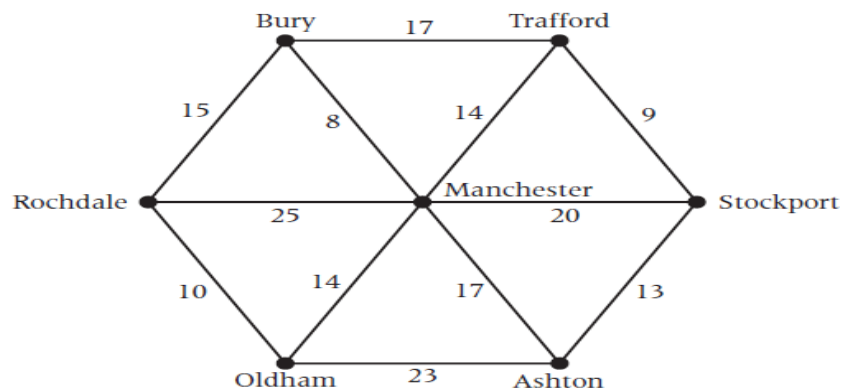
12. (a) (i) Apply the algorithm which uses a stack to evaluate the following expression:  $5\ 4\ 6\ +\ *\ 4\ 9\ 3\ /\ +\ *$  (8m) CO2- App (16)  
(ii) Apply the algorithm to find the postfix form for  $(A-B)*(C+D)$  using a stack. (8m)

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)
13. (a) Create a binary search tree for the following numbers start from an empty binary search tree. 45, 26, 10, 60, 70, 30, 40 Delete keys 10, 60 and 45 one after the other and show the trees at each stage. CO2- App (16)

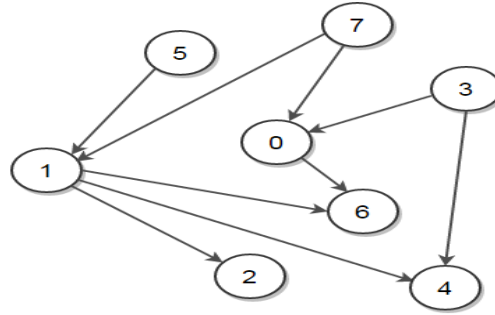
Or

- (b) Draw a B-Tree of order 3 by inserting the following elements 3, 14, 7, 1, 8, 11, 17, 13, 6, 23, 12, 20, 26, 4, 16, 18, 24, 25, 19 and delete nodes 11, 1, 20, 26, 16 from it. CO2- App (16)
14. (a) The diagram below shows roads connecting places near to Rochdale. The numbers on each arc represent the time, in minutes, required to travel along each road. A person wants to distribute the college pamphlets to all the places near to Rochdale. Use Minimum Spanning algorithms to find the minimum time required to distribute the pamphlets. CO2- App (16)

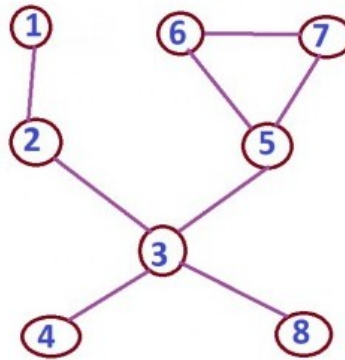


Or

- (b) (i) How many topological orderings does the following directed acyclic graph have? Explain how you arrived at those orderings. CO2- App (8)



- (ii) Apply the algorithm to find the articulation points in a graph with step by step description. CO2- App (8)



15. (a) Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function  $h(X) = X \pmod{10}$ , show the resulting. CO2- App (16)
- Separate chaining hash table.
  - Open addressing hash table using linear probing.
  - Open addressing hash table using quadratic probing.
  - Open addressing hash table with the second hash function  $h_2(X) = 7 - (X \pmod{7})$ .

Or

- (b) Write an algorithm to sort a set of 'N' numbers using quick sort. CO2- App (16)  
 Demonstrate the algorithm for the following set of numbers:  
 88, 11, 22, 44, 66, 99, 32, 67, 54, 10.