Question Paper

Exam Date & Time: 04-Jan-2023 (10:00 AM - 01:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal School of Information Sciences (MSIS), Manipal First Semester Master of Engineering - ME (VLSI Design) Degree Examination - January 2023

Data Structures [VLS 5101]

Marks: 100

Duration: 180 mins.

Wednesday, January 4, 2023

Answer all the questions.

1)	(TLO 1.1) Define header file for the following problem.	(10)
	"Mr. X starts bike rental services in Bengaluru. He maintains the details of	
	the vehicle like bike_id, bike_name, bike_cc, hourly_charges etc. Rental	
	charges varies with bike_cc. Less than 125 CC hourly charges of 20	
	rupees, 125 CC - 150 CC 25 rupees and above 150 CC 30 rupees per	
	hour. Create transaction for renting the available bike and calculate the rental cost accordingly ". (10 marks)	
2)	Design data structure to pixel data in a single linked list. Write function to	(10)
	insert and delete element in O(1) time. (TLO:2.1)(2+4+4)	
3)	What is Stack data structure? List applications of Stack. Provide data structure for array based Stack. Implement push() and pop() functions. (TLO: 2.2) (1+1+2+3+3 marks)	(10)
4)	Design data structure for linked list based Queue to store process information like process_id, name and process_status. Write functions to create new queue, add to queue and delete from queue. (TLO: 2.3) (3+2+3+2 marks)	(10)
5)	(TLO 2.4) Q4. (2.5x4 = 10)	(10)

Index	Key/ Data	
Order of Insertion	ALC ASTC 167 1910 C 114	
1	10	
2	8	
3	6	
4	17	
5	9	
6	22	
7	10	
8	0	
9	12	
10	53	
11	9	
12	3	

Table 1

Create a binary search tree (BST) from the Table 1. Delete key 8 from BST and display the BST. Insert key 11 and 7 to the BST and display the BST. What is the height of the BST? In which level key 7 is present in the BST?

- ⁶⁾ What is hashing? With an example explain closed hashing. Explain any ⁽¹⁰⁾ two techniques to overcome collision problem. Define data structure to store integer values in hash table of size 10 and a function to initialize the hash table. (TLO:4.1) (1+2+2+5 marks)
- 7) Implement a sorting technique that works on O(N.logN). Illustrate with an ⁽¹⁰⁾ example. (TLO:3.1) (6+4 marks)
- ⁸⁾ What is Minimum Spanning Tree? Write pseudo code for Kruskal's ⁽¹⁰⁾ algorithm to find Minimum Spanning Tree. Illustrate with an example by considering a graph with 6 vertices. (TLO: 4.2) (2+4+4 marks)
- ⁹⁾ Consider a graph with 5 Vertices and represent the graph using Adjacency ⁽¹⁰⁾ matric and Adjacency list. Traverse the graph using BFS and DFS Technique.(TLO:4.2) (5+5 marks)
- ¹⁰⁾ Given two linked list A and B, Create linked list C = A intersection B. (10) Define the data structure for the following problem and write the function List * intersection(List *, List *). Note: Assume List * Initialize_list() and List * insert_at end(List *, int) are implemented. (TLO:3.1; TLO: 2.1; TLO:2.2) (2+8 marks)

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