



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous College Affiliated to University of Mumbai)

End Semester Examination		
Max. Marks: 60	Aug 2022	Class: S.E.
Semester: III	Duration: 120 min.	Branch: IT/COMP
Course Code: CS/IT 202		
Name of the Course: Data Structures		
Instructions: (1) All Questions are Compulsory (2) Draw neat diagrams (3) Assume suitable data if necessary		

Question No.	Question	Max Mks	CO-B L-PI
Q. 1a	1) If the MAX_SIZE is the size of the array used in the implementation of a circular queue. How is rear manipulated while inserting an element in the queue? (Select appropriate option) a) rear=(rear%1)+MAX_SIZE b) rear=rear%(MAX_SIZE+1) c) rear=(rear+1)%MAX_SIZE d) rear=rear+(1%MAX_SIZE)	1	1-3-2. 1.2
	2) What is the output of the following code? Justify your answer with a supportive diagram. ListNode* solve(ListNode* head) { ListNode* prev = NULL; if(head == NULL) { return head; } if(head -> next == NULL) { return head; } ListNode* curr = head -> next; while (head != NULL) { head -> next = prev; prev = head; head = curr; if(curr != NULL) { curr = curr -> next; } } }	2	



	<pre> return prev; } a. Returns the original linked list b. Returns the linked list after reversing it c. Returns a linked list containing elements at odd indices only d. None of the above 3) The following C Function takes a singly- linked list of integers as a parameter and rearranges the elements of the lists. The function is called with the list containing the integers 1,2,3,4,5,6,7 in the given order. What will be the contents of the list after the function completes execution? Justify your answer struct node{ int value; struct node* next; }; void rearrange (struct node* list) { struct node *p,*q; int temp; if (! List ! list->next) return; p->list; q=list->next; while(q) { temp=p->value; p->value=q->value; q->value=temp; p=q->next; q=p ? p->next : 0; } } a) 1, 2, 3, 4, 5, 6, 7 b) 2, 1, 4, 3, 6, 5, 7 c) 1, 3, 2, 5, 4, 7, 6 d) 2, 3, 4, 5, 6, 7, 1 4) State the use of Generalized linked list and represent the following polynomial using GLL (draw diagram) also give C declaration of the structure used. $5x^{10}y^4 + 4x^5y^3 - 3x + 10$ </pre>	2	
	<p>Q. 1b Write an algorithm/function to convert postfix expression to infix expression. Draw a supportive diagram and explain with an example</p> <p style="text-align: center;">OR</p> <p>Write the following functions</p> <p>a. recursive function to find the length of a singly linked list.</p>	5	
		10	1-3-4. 1.2



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	b. push() for stack using linked list		
Q.2.a	Write an algorithm to insert an element in a binary search tree. Construct a Binary Search Tree by inserting the data in the given order: 12, 15, 3, 35, 21, 42, 14, 11 and then delete the data 15 and 12 from the binary search tree.	08	2-3-1. 4.1
Q.2.b.	<p>Construct an AVL tree, where nodes are inserted in the following order. Mention the type of rotation when applied. Show the balance factor of each node after insertion. 10, 20, 15, 25, 30, 16, 18, 19.</p> <p>Perform Deletion of node 15 and node 25 on the above-constructed AVL tree</p> <p style="text-align: center;">OR</p> <p>Construct a B-tree of order-5 for the given elements: 23, 13, 32, 31, 21, 26, 22, 28, 25, 20, 18, 33, 37, 39</p> <p>After construction of the B-tree, perform deletion operation on the data given below in the following given sequence:</p> <p>1. delete(37) 2. delete(28)</p> <p>Show the output steps after each element insertion and deletion of a node.</p>	08	2-3-1. 4.1
Q.3.	<p>i. Write an algorithm to traverse a graph using Breadth First Search</p> <p>ii. Represent the given graph using the adjacency matrix.</p> <p>iii. In what order will the nodes be visited using a Breadth-first Search Algorithm (start node=b)? Show the status of the required data structure used.</p> <p>Policy: Visit the node in alphabetically increasing order.</p>	03 01 04	2-3-2. 1.2



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Q.4	<p>For the given array create an initial heap (Max Heap) and sort them in increasing order using Heap Sort. Show the intermediate steps of creation and sorting.</p> $A=[15, 3, 17, 12, 84, 25, 6, 22, 9]$ <p>OR</p> <p>What is Fibonacci Heap? Explain 'extract a min key' operation with the help of an example.</p>	08	3-3-2. 1.2
Q.5	<p>i) Insert the following given elements in the hash table of size 10 using the modulo-division method ($h(k)=key \% \text{table size}$) and solve the collision if any using the quadratic probing resolution technique. Show the calculation steps clearly for each key hashing. Give the load factor after all keys are hashed.</p> <p>12345678, 23458798, 34987768, 67543988, 887655439, 45323450</p> <p>ii) Explain the effect of Primary and Secondary Clustering in Hashing with appropriate example.</p>	05 03	4-3-2. 1.2