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SRM Institute of Science and Technology
Department of Computer Science and Engineering
Delhi – Meerut Road, Sikri Kalan, Ghaziabad, Uttar Pradesh – 201204

SRM
DELHI-NCR CAMPUS, GHAZIABAD (U.P.)

Academic Year: 2023-24 (ODD)

Test: Internal Examination-I
Course Code & Title: 21CSC201J/ Data Structures and Algorithms
Year & Sem: II Year/III Sem

Date & Session: 17/08/2023/FN
Duration: 1 Hour
Max. Marks: 30

Part - A

Answer all questions **(10Q x 1M = 10 Marks)**

Q. No	Question	Marks	BL	CO	PO
1	Which data structure uses the Last-In-First-Out (LIFO) principle? a) Queue b) Stack c) Linked List d) Binary Tree	1	1	1	1
2	The main purpose of an ADT is to_____ a) Improve the performance of algorithms b) Provide a way to implement data structures in hardware c) Reduce the complexity of a program d) Encapsulate data and operations in a well-defined interface	1	2	1	1
3	Which of the following data types is considered a primitive data type in most programming languages? a) Array b) String c) Integer d) Queue	1	1	1	1
4	_____is the keyword used to free dynamically allocated memory for a structure pointer in C. a) free b) deallocate c) release d) delete	1	1	1	1
5	The time complexity of an algorithm is expressed as O(n^2). This indicates that the algorithm's running time grows: a) Linearly with the input size n b) Quadratically with the input size n c) Exponentially with the input size n d) Logarithmically with the input size n	1	2	1	1
6	Time complexity of an algorithm is measured in terms of: a) Clock cycles b) CPU instructions c) Memory usage d) Input size	1	1	1	1
7	The malloc() function in C/C++ returns a pointer to the memory block if the allocation is successful. If the allocation fails, it returns: a) NULL b) 0 c) -1 d) void	1	1	1	1
8	What is a self-referential structure? a) A data structure that refers to itself within its definition. b) A structure that is recursive in nature.	1	1	1	1

	c) A structure that contains pointers to other structures. d) A structure that is only used in object-oriented programming.				
9	The main advantage of using binary search over linear search is _____. a) Binary search is easier to implement b) Binary search works for unsorted lists c) Binary search requires less memory d) Binary search has a lower time complexity	1	2	1	1
10	What is the key idea behind the insertion sort algorithm? a) Divide the list into two sublists and merge them. b) Build the final sorted array one element at a time. c) Select the maximum element and move it to the end of the list. d) Swap adjacent elements until the list is sorted.	1	1	1	1

Part B
Answer any three questions

3Q x 4M=12 Marks

11	Compare and Contrast Linear & Non-Linear Data Structures with example.	4	2	1	1
12	Write an algorithm to search an element in the given list using Linear Search. Also analyze its time complexity.	4	3	1	2
13	What do you mean by Abstract Data Type (ADT)? Briefly discuss with example.	4	1	1	1
14	How can memory be dynamically allocated and deallocated when it is no longer required?	4	2	1	2

Part C
Answer all questions

1Q x 8M= 8 Marks

15	(A) Design an algorithm for Insertion Sort. Illustrate it to sort the following elements {16, 8, 4, 13, 29, 30}.	8	3	1	3
	(OR)				
	(B) Explain in detail about asymptotic notations used in program complexity by taking suitable examples.	8	3	1	3