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DECEMBER 2023 (REEXAM)

S.Y. B. TECH COMPUTER SCIENCE & ENGINEERING (AIML) (SEMESTER - I)

COURSE NAME: FUNDAMENTALS OF DATA STRUCTURES COURSE CODE: CMUA21202

(PATTERN 2020)

Time: [2 Hrs] **[Max. Marks: 60]**

Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed.**
3) **Use suitable data wherever required.**
4) **All questions are compulsory. Solve any two sub questions each from each Question 1, 2, 3,4,5, and 6 respectively.**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) Explain the purpose of the frequency count method and how it is used to analyze the time complexity of algorithms.	[5]	1	2
	b) Compare and contrast the advantages and disadvantages of using interpreters and compilers.	[5]	1	2
	c) Explain different types of data structures with examples.	[5]	1	2
Q2	a) Develop a pseudocode to Add the Sparse matrix with suitable example.	[5]	2	3
	b) Illustrate with the given example below what is Row Major and column major? Identify the address of an element A [1][2] in row-major, column major order. A[0][0] A[0][1] A[0][2] A[0][3] A[1][0] A[1][1] A[1][2] A[1][3] A[2][0] A[2][1] A[2][2] A[2][3]	[5]	2	3
	c) Construct a pseudocode for fast transpose of the given sparse matrix [1, 0, 0], [0, 2, 0], [0, 0, 3].	[5]	2	3
Q3	a) Make use of Bubble sort algorithm on the following payment receipt numbers and demonstrating list after every pass. Receipt Numbers: [1563, 1524, 1511, 1521, 1510]	[5]	3	3
	b) Assume suitable search algorithm to find the index of the bill numbers 894 in the following sorted list of bill numbers:	[5]	3	3

	890, 894, 898, 892, and 893. Provide step-by-step details of the search process. c) The keys 15, 12, 18, 5, 2, 17, 3 and 25 are inserted into an initially empty hash table of length 10 using open addressing with hash function h(k) = k mod 10 and linear probing. Stepwise show the contents of the hash table after insertion of every key.	[5]	3	3
Q4.	a) Justify your understanding of sequential and linked organizations to describe how each approach manages memory. Discuss a real-world scenario where one organization would be more advantageous than the other based on memory considerations. b) Apply your knowledge to design an algorithm for efficiently deleting a node from a specified position in a circular linked list. Discuss any unique considerations for deletion in a circular context. c) Apply the principles of an Abstract Data Type (ADT) to design a linked list class in a programming language. Ensure that the class allows for creating the list, inserting at any position, and deleting from any position.	[5] [5] [5]	4 4 4	3 3 3
Q.5	a) Solve the given expression for converting infix expression to prefix expression using stack (A-B)*(D/E) b) Examine stepwise stack contents for converting the following infix notation to postfix notation. ((7-(5+3)) / (9+ (6/3)) ^3 Support your answer with appropriate pseudo code. c) Evaluate the following postfix expression. Show all steps: ab*c-d+e+ where a=9, b=3, c=6, d=4 and e=8	[5] [5] [5]	5 5 5	3 3 3
Q.6	a) Apply Priority queue for scheduling the CPU in Operating System and demonstrate it with proper example. b) By Applying circular queue with array size of 5, Perform the following operations on this queue and show the sequence of steps with necessary diagrams indicating values of front, rear and contents of queue : i. insert 50,70,30 ii. delete an element v. insert 80	[5] [5]	6 6	3 3

	vi. delete an element vii. delete an element viii. insert 90 c) Demonstrate the concept of Queue with overflow and underflow condition. Provide required justification with suitable Java constructs. Analyze the time complexity of this program.	[5]	6	3

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