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VIT
 Vellore Institute of Technology
 (Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test II – October 2022

Programme	: B.Tech. CSE	Semester	: FALL 2022-23
Course Code	: BCSE202L	Class Nbr	: CH2022231001450
Course Title	: Data Structures and Algorithms	Slot	: A2 + TA2
Faculty	: Dr. Gowdham Prabhakar	Max. Marks	: 50
Time	: 90 Minutes		

Answer all the Questions (5 X 10 = 50 Marks)

Q. No.	Question	Marks
1.	<p>Let $S = \{ I_1, I_2, \dots, I_n \}$ be a set of 'n' closed intervals. The intervals are said to be overlapping if $I_1 \cap I_2 \neq \Phi$ (non-empty). The overlapping intervals $I_1 = [a_1, b_1]$ and $I_2 = [a_2, b_2]$ merged as $[\min\{a_1, a_2\}, \max\{b_1, b_2\}]$. For example, $I_1 = [2, 6]$ and $I_2 = [5, 7]$ are overlapping intervals and after merging the resultant interval is $[2, 7]$. Your task is to merge all the overlapping intervals of S and display all the non overlapping intervals. For example, consider the 6 closed intervals as the input given by user as $[2, 6], [3, 4], [5, 7], [8, 9], [9, 11], [13, 16]$ then the overlapping interval after merging will be $[2, 7], [8, 11], [13, 16]$.</p> <p>Which data structure is most suitable to perform the above task. Write an algorithm by using the mentioned data structure. Illustrate your algorithm for any sample input.</p>	10
2.	<p>There are 'n' number of balls in a box. The colors of the balls are red and blue. You are requested to stack the balls in the bottom sealed basket one by one. The order of placing the balls is two consecutive red balls followed by the two consecutive blue balls. Later, create two empty queues. Now, remove the last inserted ball from the basket and place it in the first queue. Similarly remove the next ball from the basket and insert in the second queue. Write an algorithm to repeat this process until the basket is empty and also print the color of the balls in both queues.</p>	10
3.	<p>Create a linked list that consists of integers. Write an algorithm to insert a new element between every pair of two consecutive elements. The new element is the average of two consecutive integers. For example, if the list is $12 \rightarrow 34 \rightarrow 56 \rightarrow 78 \rightarrow 15$, then the average of two consecutive integers 12 and 34 is 23 should be inserted between 12 and 34. The average of 34 and 56 is 45,</p>	10

	which should be inserted as shown below: 12 --> 23 --> 34 --> 45 --> 56 --> 67-->78-->46.5--> 15.	
4.	<p>The distance travelled by the first <i>bus</i> after t seconds is given by the polynomial $P1$ while the distance travelled by the second bus after t seconds is given by the polynomial $P2$. Which data structure is most suitable to represent the above scenario. Write an algorithm by using the mentioned data structure to find how far apart will the two buses be after t seconds. For example,</p> <p>Input</p> <p>$P1: At^2+Bt$</p> <p>$P2: Qt^2+Pt$</p> <p>Output</p> <p>$(A-Q) t^2+(B-P) t$</p>	10
5.	<p>Consider the following infix expression</p> $(A * B) / C + D - F$ <p>Find an equivalent postfix expression. Show the stack content at each step when converting the infix expression to an equivalent postfix expression.</p>	10
