

**Mid Semester Examination 2023**

**Name of the Program: B.TECH, ECE**

**Name of the program: B.Tech**

**Name of the Course: Data Structure using C**

**Semester: IV**

**Course Code: TCS-410**

**Time: 1:30 Hours**

**MM: 50**

**Note:**

1. Answer all the questions by choosing any one of the sub questions.
2. Each question carries 10 marks.

|    |  |       |
|----|--|-------|
| Q1 | (10*2= 20 MARKS)   |       |
| A  | What is data structure? Explain.<br>What are the objectives of Data Structure?   | CO: 1 |
| B  | Write a program to sum the first n natural numbers using tail recursion.   |       |
| Q2 | (10*2= 20 MARKS)   |       |
| A  | i. What is the output of following code? Duly explain.<br><pre>void main() {     char *str= "India";     char *ptr = str;     printf("%c %c", *(ptr + 3), str[1]); }</pre><br>ii. What is the output of the following code?<br><br><pre>main() {     char *string = "Hello!";     char str[] = "Hello";     printf("%d\t %d\t %d", sizeof(string), sizeof(str), sizeof("Hello!")); }</pre> | CO: 1 |
| B  | What is a sparse matrix? How is it represented in a memory?  |       |
| Q3 | (10*2= 20 MARKS)   |       |

|     |  |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
|-----|--|--------------|-----|--|-----|------|-----|--|-----|------|---|--|---|--|---|
| A   | Convert the following infix expressions into postfix forms:<br>a) $((a + b) / c) + ((d - e) * f)$ b) $(x + (y \% z) - p / (q * r))$  | CO:<br>1 & 2 |     |  |     |      |     |  |     |      |   |  |   |  |   |
| B   | Evaluate the following expressions using stack:<br>a) 35, 40, +, 22, 13, -, 4, *, +    b) 48, 42, 7, +, 25, 15, +, -, *  |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| Q4  | (10*2= 20 MARKS)   | CO: 2        |     |  |     |      |     |  |     |      |   |  |   |  |   |
| A   | <p>i. Write a code to connect the linked list pointed by p to the linked list pointed by q where the name of the address field is 'next'?</p> <p><math>p \rightarrow</math> <table border="1"><tr><td>100</td><td></td></tr></table> <math>\rightarrow</math> <table border="1"><tr><td>200</td><td>NULL</td></tr></table>    <math>q \rightarrow</math> <table border="1"><tr><td>500</td><td></td></tr></table> <math>\rightarrow</math> <table border="1"><tr><td>700</td><td>NULL</td></tr></table></p> <p>ii. What will be the value in the pointer variable ptr after the execution of the code: <code>ptr = ptr-&gt;next-&gt;next-&gt;next;</code></p> <p><math>ptr \rightarrow</math> <table border="1"><tr><td>A</td><td></td></tr></table> <math>\rightarrow</math> <table border="1"><tr><td>B</td><td></td></tr></table>    <table border="1"><tr><td>C</td><td>NULL</td></tr></table></p> |              | 100 |  | 200 | NULL | 500 |  | 700 | NULL | A |  | B |  | C |
| 100 |  |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| 200 | NULL   |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| 500 |  |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| 700 | NULL   |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| A   |  |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| B   |  |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| C   | NULL   |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| B   | Suppose LIST1 is a linked list in memory. Write an algorithm which copies LIST1 into another linked list LIST2.  |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| Q5  | (10*2= 20 MARKS)   | CO: 2        |     |  |     |      |     |  |     |      |   |  |   |  |   |
| A   | <p>i. What is the advantage of using a linked list to implement a stack rather than an array?</p> <p>ii. What is deque? What are the different operations performed on a double ended queue?</p>   |              |     |  |     |      |     |  |     |      |   |  |   |  |   |
| B   | <p>i. Write an algorithm to add an element in a circular queue.</p> <p>ii. Write a the function to push an element in a stack.</p>   |              |     |  |     |      |     |  |     |      |   |  |   |  |   |