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|  |  |  | Register Number:Date: |
| **ST. JOSEPH’S UNIVERSITY, BANGALORE-27** |
| **BSc- II SEMESTER** |
| **SEMESTER EXAMINATION: April 2024**(Examination conducted in May/June 2024) |
| **CS221- DATA STRUCTURES USING C** |
| **Time- 2 Hrs.** |  |  **Max Marks-60** |

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| **NOTE:** There are **THREE** sections in the question paper carrying 10, 20 and 30 marks each.  |
| **SECTION A****Answer any FIVE of the following questions                    (5\*2=10 marks)** |
| **Q1.** | What do you understand by Data Structures? How are they classified? | 2 |
| **Q2.** | Given the list of number below show how they are sorted using the **Bubble sort** technique. Show it by drawing a tabular form. **50, 30, 40, 8, 2** | 2 |
| **Q3.** | Convert the following INFIX expression into POSTFIX expression using a STACK. **(A + B – C\*2)/( E –F)^3**  | 2 |
| **Q4.** | Mention four **uses** of a STACK data structure.  | 2 |
| **Q5.** | Create a BINARY **SEARCH TREE** from the list of numbers given below. Give the **PREORDER** traversal of this BST. **70, 50, 90, 80, 60, 30, 35, 75** | 2 |
| **Q6.** | Convert the infix expression given below into a **binary tree** with operands as the leaf nodes. Give the post order traversal **( A + B – C)\*2/(D - E^3)**  | 2 |
| **SECTION B** |
| **Answer any FIVE of the following 5x4=20** |
| **Q7.** | Write **ALGORITHM** to convert INFIX to POSFIX NOTATION using a STACK. | 4 |
| **Q8** | Write a program in C to input some numbers into an array and sort them using **INSERTION SORT** technique.  | 4 |
| **Q9.** | Declare a new data type to represent the **node of a Queue** and write a function subprogram to remove ( **Dequeue**) the first data item from the queue.  | 4 |
| **Q10.** | What is the difference between **STATIC** and **DYNAMIC** memory allocation? With examples show how memory is allocated. Create a new data type to represent the node of a **doubly linked list** and show how you would allocate memory to a node and assign **30 to the integer** data item in the node. | 4 |
| **Q11.** | Find the time COMPLEXITY of the algorithm represented by following **RECURRENCE** **FORMULA**.**T(n) = 1 for n = 1****Otherwise T(n) = 2T(n/2) + n for n >0** | 4 |
| **Q12** | Write a code segment to show how you would convert a decimal number into **binary equivalent** using a stack.( No need to write code for functions Push() and Pop() **,** just use them **)**  | 4 |
| **SECTION C** |
| **Answer any THREE of the following**  **3x10=30** |
| **Q13.** | 1. Given the **POSTORDER** traversal of a BST. Create the BST. Show steps involved.

Post order traversal: **40, 30, 60, 50, 90, 80, 70**b) What is the condition to use **binary search method**? Write a function program in C to **search for a** given number in a list of numbers using binary search technique. Use it in the main program to search for a given number in a list of numbers.  | 37 |
| **Q14.** |  Write a menu driven program in C to show the working of an **ordered linked list.** The options are**: a) Insert a number, b) display the list, c) Delete a given number, and d) EXIT** | 10 |
| **Q15.** | 1. a) Show how you would evaluate the following POSTFIX expression using a stack. **5, 7, +, 2, -, 2, \*, 8, 3, -, /, 6, +**
2. **b)** Create a **new data type** to represent the node of the **BINARY SEARCH** **TREE** having integer data item. Write a function sub program to **search** for a number in the BST.
 | 37 |
| **Q16.** | a) If “**h**” is the height of a BST. What is the formula to find the total number of nodes in a BST? Draw a BST of height h=2 and show how the formula illustrates the total number of nodes in the BST. b) Write a program in C using a **STACK** to check whether a given string is a **PALINDROME**.  | **3****7** |