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| **ST. JOSEPH’S UNIVERSITY, BANGALORE-27** | | | | |
| **BSc- II SEMESTER** | | | | |
| **SEMESTER EXAMINATION: APRIL 2023**  (Examination conducted in May 2023) | | | | |
| **CS221- DATA STRUCTURES USING C** | | | | |
| **Time- 2 Hrs.** | |  | **Max Marks-60** | |

| **NOTE:** There are **THREE** sections in the question paper carrying 10, 20 and 30 marks each. | | | |
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| **SECTION A**  **Answer any FIVE of the following questions                              (5\*2=10 marks)** | | | |
| **Q1.** | Declare a data type to represent the node of a **POLYNOMIAL** list having Coefficient and power and a link to the next node as data items. Write a function program to return the address of a new node with the data items. | | 2 |
| **Q2.** | Given the list of number below show how they are sorted sing **Bubble sort** technique using a tabular form.  **30, 40, 5, 7,10** | | 2 |
| **Q3.** | Convert the following INFIX expression into POSTFIX expression using a STACK.  **A + (B-C)^2 –(E+F)\*5/G** | | 2 |
| **Q4.** | With an example each explain **two types of data structures**. | | 2 |
| **Q5.** | Create a **BINARY SEARCH TREE** from the list of numbers in the order given below. What is the **height** of the tree?  **60, 85, 40, 50, 70, 65, 30, 45, 35, 75** | | 2 |
| **Q6.** | Convert the infix expression given below into a binary tree with operands as the leaf nodes.  **(A + B \* C )/( E + F )** | | 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 **SELECTION SORT** technique. | 4 |
| **Q9.** | | Declare a new data type to represent the **node of a Linked list** and write a function subprogram to return the number of nodes in a linked list. | 4 |
| **Q10.** | | What is Asymptotic notation is used for? Explain the meaning of Big-O notation to measure the complexity of an algorithm. | 4 |
| **Q11.** | | Create a new data type to represent the node of the **BINARY SEARCH** **TREE** having integer data item. Write a recursive function to give the **INORDER** TRAVERSAL of the binary search tree. | 4 |
| **Q12** | | Write a function subprogram to insert a number into a **BINARY SEARCH** **TREE**. | 4 |
| **SECTION C** | | | |
| **Answer any THREE of the following**  **3x10=30** | | | |
| **Q13.** | | 1. Given the **preorder** and **inorder** traversals of a BST. Create the BST. Show steps involved. PREORDER: **A B E C F D G H I**   INORDER : **E B F C A G D I H**  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. | 3  7 |
| **Q14.** | | Write a menu driven program in C to show the working of an **ordered linked list.** The options are**: Insert a number, display the list, Delete the first number, and EXIT** | 10 |
| **Q15.** | | 1. Show how you would evaluate the following POSTFIX expression using a stack.  **6 , 10, 3, +, 5, - , 2, \*, 5, 3, -, 2, ^, /, +** 2. How does a **QUEUE** differ from a stack? Create a new data type to represent the node of a Queue. Write the following function related to the queue  i) Enqueue() ( to input a number into the queue) ii) Dequeue() ( to remove the first item from the queue). | 3  7 |
| **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) After declaring a new data type to represent a STACK. Write functions Push(), Pop() and Process() to process the operands popped from the stack. Use these functions to write a program to **evaluate a postfix expression.** | **4**  **6** |