

INDIAN STATISTICAL INSTITUTE

Semester I Examination: (2023-2024)

M. Tech. (QR & OR) – I Yr. (E-Stream)

Programming Techniques and Data Structures

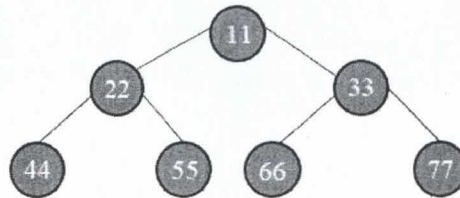
Date: 21.11.2025

Maximum marks: 100

Duration: 3 hrs.

[Answer as many questions as you can.]

1 (a) What will be the results of preorder, postorder and inorder traversals of the following binary tree.



(b) Write down two advantages and two disadvantages of storing certain information using a binary tree data structure. [(3×2)+(2×2) = 10]

2. What is the full form of BST? Consider 7 integer values of your choice and write the step-by-step algorithm to construct a BST using these values from an initially empty BST. Draw the final structure obtained. [1+ 7 + 2 = 10]

3 (a) What are the different operations performed on a queue data structure and what are their respective time and space complexities?

(b) Write C functions to add an element into a stack and display the final content. [(2+2+2)+2+2 = 10]

4. Write a C program to print the contents of a doubly linked list by traversing it in the reverse direction. [12]

5. Consider the integers 1, 7, 3, 9, 4, 5, and 6. Write down the steps to sort these integers using Quick Sort algorithm with the element 1 as the pivot element. [10]

6. Give short answers to the following questions:

i) How many bits are available to store a given value into an unsigned int type variable of C programming language?

ii) Which library function may be used to get the storage size (number of bytes) of certain C variable type?

iii) What is the return type of C library function “exit ()”?

iv) Give examples of two C preprocessor directives.

v) Give an example of C while loop statements which will never run the statements in its scope.

vi) Give an example of a C for loop statement which will never terminate normally.

vii) Give an example of a C if-else block where the else part will be executed.

viii) Write an example of C statement opening a text file in both “Read” and “Write” modes.

ix) Which standard C library function is used to compare two strings? Write its header file name.

x) When will the expression P&&Q be false, where P and Q are C integer type variables? [10 × 1 = 10]

7. Write a C program which should take your date of birth as input in DDMMYYYY format and print your age in number of years, months and days. [12]
8. Write a C program which should minimize memory usage to read a given number of integer values from the keyboard, print their minimum as well as the position(s) of its occurrence in the input sequence. [6 + 6 = 12]
9. (a) Differentiate between C structure and union type variables.
(b) For a school, create the student register consisting of First Name, Surname, number of days attending the school and the percentage of total marks scored in the last examination of its students. Declare necessary variables and write C functions to populate the register in the computer memory from available information in a file and take the decision whether the students scoring the first minimum and second minimum remained absent in more than 20% of the classes. [5 + 5 + 5 + 5 = 20]
10. Write a C program using the switch-case statement to print whether an input alphabetic character (can be capital or small) is a vowel or a consonant. [10]
