Roll No..................

National Institute of Technology, Hamirpur
BTech (Physics & Photonics Sciences)
CS-201, Data Structures
End Semester Examination, December- 2022

Duration: 3:00 Hours | Total pages-2 | Max. Marks: 50

Note: Attempt all the questions. Be brief and to the points in writing answers.
Assume suitable data if necessary. Preferably, write the answers in sequential order.

1. Write the output of the following C program. Also explain its logic.

   ```c
   #include<stdio.h>
   int fun(char *str1){
   char *str2 = str1;
    while(*++str1);
    return (str1-str2);}
   int main()
   {char *str = "data structure exam";
    printf("%d", fun(str));
    getchar();
    return 0; }
   ```
   (2)

2. Evaluate the given postfix expression 10 5 + 60 6 / * 8 − **(2)**

3. Assume that the operators +, -, ×, are left associative and ^ is right associative. The order of precedence (from highest to lowest) is ^, ×, +, -. Find the postfix expression corresponding to the infix expression a + b×c-d^e^f **(2)**

4. A complete n-ary tree is a tree in which nodes having no children. Let I be the number of internal nodes and L be the number of leaves in complete n-ary tree. If the values of L=41 and I=20, then calculate the value of n. **(2)**

5. A tree has 2n vertices of degree 1,3n vertices of degree 2, n vertices of degree 3. Find the number of vertices and edges in the tree. **(2)**

6. An n x n array v is defined as follows: $v[i, j] = i - j$ for all i, j, $1 \leq i \leq n$, $1 \leq j \leq n$. Find the sum of the elements of the array v. **(2)**

7. Differentiate between linear search and binary search. Illustrate the binary search algorithm by taking an array of elements. **(3)**

8. Write down various orders of depth first traversals of the following graph? Consider 'a' as source vertex. **(3)**

1
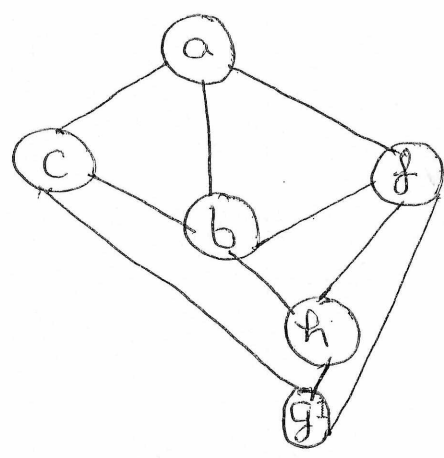
9. Give brief description of the following terms:
    a. Algorithm for reversing a string
    b. Use of header and tail node in the linked list
    c. Heap sort   **(4)**
    d. Biconnected components

10. What is circular double link list. Write down the algorithm for insertion and deletion of elements in the circular double link list.   **(5)**

11. Consider a hash table of size 10. Insert the following keys 72, 27, 36, 24, 63, 81, 92, and 101 into the table.
    a. Using linear probing method
    b. Using double hashing method, Take h1 = (k mod 10) and h2 = (k mod 8).   **(5)**

12. Explain merge sort algorithm. Explain each step clearly while sorting the following array using merge sort   "39, 9, 81, 45, 90, 27, 72, 18" .   **(6)**
    Also find out its complexities.

13. Explain the Huffman coding algorithm. Create the Huffman tree with the following nodes arranged in priority queue.   **(6)**

A	B	C	D	E	F	G	H	I	J
7	9	11	14	18	21	27	29	35	40

14. What is B tree. Create a **B tree** of order 5 by inserting the following elements: 3, 14, 7, 1, 8, 5, 11, 17, 13, 6, 23, 12, 20, 26, 4, 16, 18, 24, 25, and 19. Write down its various applications.   **(6)**