National Institute of Technology Hamirpur
Himachal Pradesh-177 005, India
End Semester Theory Examination (November2023)
Department of Computer Science and Engineering

Course: B. Tech.   **Semester:** 3rd
Subject Code: CS-201   **Duration:** 3Hrs.
Subject Name: Data Structure   **Max. Marks:** 50
Date: 28/11/2023   **Time:** 9:30am – 12:30pm
General Instructions (All the questions are compulsory)

Q.1 Represent the given matrix in the form of array and linked list? What kind of matrix is it? Justify your answer.

$$\begin{bmatrix} 0 & 9 & 0 & 0 & 0 & 4 & 0 & 0 \\ 0 & 0 & 6 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 5 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 3 & 0 \\ 0 & 0 & 6 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

(5)

Q.2 Convert the following:
a) infix to postfix and prefix
i) infix expression: $(AX + (B * C))$
ii) infix expression: $((AX + (B * CY)) / (D - E))$ (4)

b) postfix to infix and prefix
i) postfix expression: $A B + C E + *$
ii) postfix expression: $AX\ BX\ CY\ AY + BY + CX * * *$ (4)

c) prefix to infix and postfix
i) prefix expression: $+ * A B * C D$ (4)
ii) prefix expression: $+ * H * * * + A * + B C D F G E J$

Q.3 Perform the following operations on polynomials and represent the expressions in the form of linked list
a) **Add** $5x^2 + 4x + 2$ and $-5x - 5$
b) **Subtract** $2x^2-7$ from $x+7x^2+1$ (2+2 =4)

Q.4 What is sorting? Write down the algorithm for bubble sort? Sort the elements given below using the same.
                23   15   29   11   1
Also discuss best, worst and average case for this sorting algorithm.   (8)

Q.5 What is the limitation of Binary Search tree? Explain how AVL tree overcome this limitation. Construct AVL tree for the following data

21,26,30,9,4,14,28,18,15,10,2,3,7

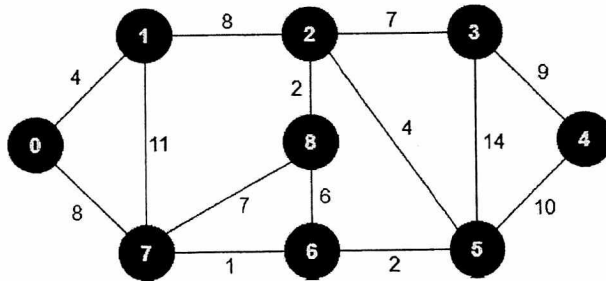Also perform step-by-step Construction of the AVL Tree for the given Sequence. (8)

Q.6 What are the advantages and disadvantages of linked list over an array? (3)

Q.7 a) Find the minimum spanning tree(MST) of a graph given below using Krushkal's Algorithm. (5)

b) Also find the MST of the above graph using Prims Algorithm. (5)