Graphic Era
HILL UNIVERSITY

End Term (Odd) Semester Examination November 2025

Roll no. **2261348**

B.Tech (CSE) III Semester
Data Structure with 'C' language.
Paper Code: TCS 302

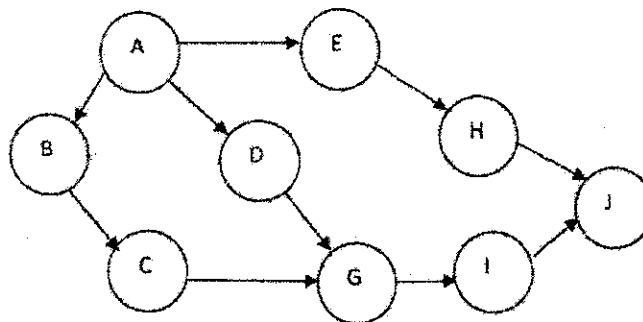Time: 3 hours   Maximum Marks: 100

Note:
  (i)   All the questions are compulsory.
  (ii) Answer any two sub questions from a, b and c in each main question.
  (iii) Total marks for each question is 20 (twenty).
  (iv) Each sub-question carries 10 marks.

Q1.   (2X10=20 Marks) (CO1, CO2, CO5)

a. Evaluate the following postfix expression using stack (show all the steps).
   4,3, *,6,4, -, *,5, /,3,2, ^, + (Here comma is used as separator only).

b. Give name and apply the graph traversal technique on the given graph, to find a path from A to J with minimum number of nodes in between. (Show all steps)

c. Assume that you have a single linked list with pointer P pointing to the first node of the linked list. Write a C function to rearrange the list so that all even-positioned nodes are stored first and then all odd position nodes. (Maintain relative order)
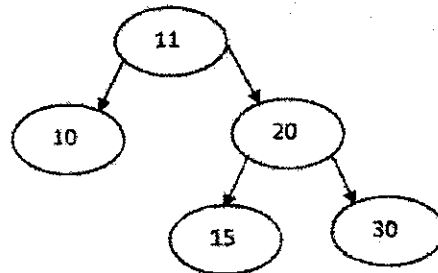   Example: 1→2→3→4→5
   Output: 1→3→5→2→4

Q2.   (2X10=20 Marks) (CO2, CO4, CO5)

a. Consider a single linked list with a pointer pointing to its head. Write a 'C' function to insert two nodes, one before the first node and one before the last node of the linked list.

b. Explain hash collision with an example. Consider a hash table of size (m) 12. Using linear probing technique with remainder division method (h(key) = key mod table size), insert following keys: 24,17,19,12,81,29,92,15, and 41 into the hash table.
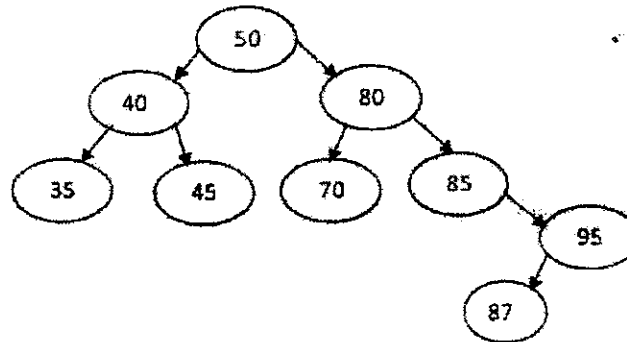
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c. i) Consider following height balance tree. Insert 18 and redraw the tree.

ii) Consider following binary search tree and delete 80 and redraw the tree.

Q3.   (2X10=20 Marks) (CO2, CO4, CO5)

a. Assume that you have two sorted singly linked lists. Pointers P and Q are pointing to the first nodes of these linked lists respectively. Write a C function to merge the given linked lists by creating third linked list.

b. Construct a balanced multi-way search tree of order 3. Insert the following keys in the given order: 20,10,30,5,40,50,15,18,2,60,70.

b. Write a C function to split a circular linked list into two halves as per user's choice (User choice is data of a node). Ensure both resulting lists are circular.
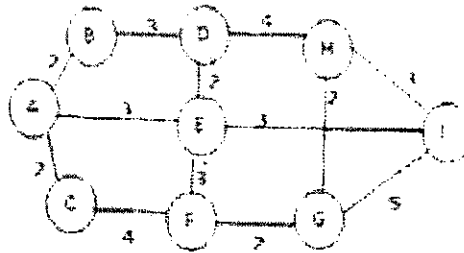
Q4.   (2X10=20 Marks) (CO3, CO4, CO5)

a. Which algorithm would you use to compress following data.
   eacdefefeabbcdbdd.
   Generate binary code for each character.

Graphic Era

End Term (Odd) Semester Examination November 2025

b. Name and apply the algorithm on the following connected weighted graph to find the shortest path from source vertex A to all vertices in the (Show all steps).
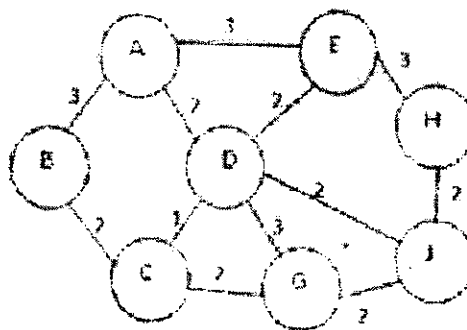

c. Write a C function to create a min heap with one key at time. Also give its worst case complexity.

Q5.   (2X10=20 Marks) (CO3, CO4, CO5)

a. Write a C program to create a weighted graph with the help of node pointers and linked list of edges.

b. You have a weighted graph for the following situation: A telecommunications company needs to lay fiber optic cables to connect multiple offices in a region. The cost of laying a cable between any two offices is assigned as weight of the edge. Name and apply an algorithm to find a network that connects all offices with the minimum total cable cost.

c. The following list is to be sorted using Merge sort: 5, 10, 15, 28, 32, 46, 17, 40, 44, Show the sorting process by indicating how the data would appear in intermediate steps (do not write code).