

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination December 2021

B. Tech in Computer Science Engineering, Semester III (CSE+EEE)

Roll No.....

CS1102: DATA STRUCTURES

Time: 03 hours

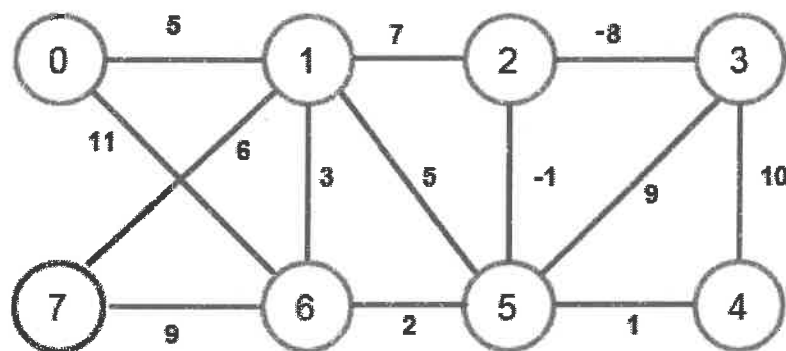
Max. Marks: 25

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

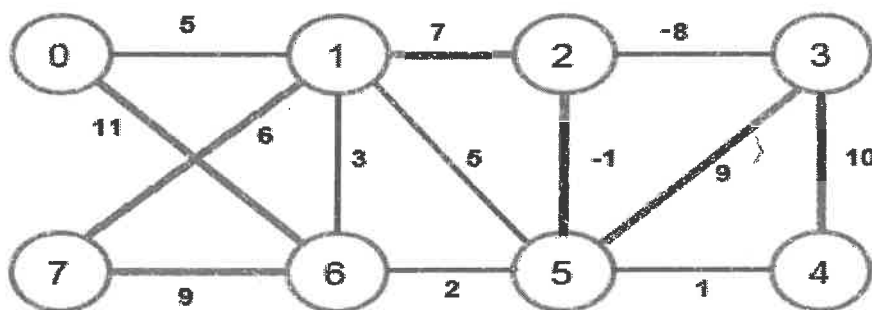
Q.1A Given a weighted undirected graph, Write JAVA Method/Algorithm that will find the maximum cost path from a given source to any other vertex in the graph which is greater than a given cost. The path should not contain any cycles. For example, consider the following graph,

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Input Let source = 0 and cost = 50.

The maximum cost route from source vertex 0 is 0 → 6 → 7 → 1 → 2 → 5 → 3 → 4, having cost 51, which is more than cost 50. The solution should return 51.



Q.1B Given a string *s*, write Java Program that will find the length of the **longest substring** without repeating characters. **04**

Example 1:

Input: *s* = "abcabcbb"

Output: 3

Explanation: The answer is "abc", with the length of 3.

Example 2:

Input: *s* = "bbbbbb"

Output: 1

Explanation: The answer is "b", with the length of 1.

Example 3:

Input: *s* = "pwwkew"

Output: 3

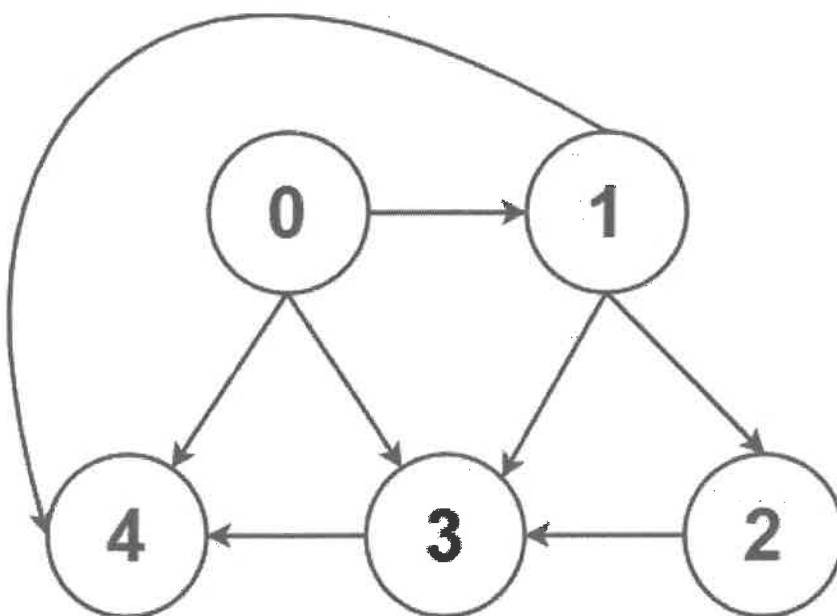
Explanation: The answer is "wke", with the length of 3.

Notice that the answer must be a substring, "pwke" is a subsequence and not a substring.

Q.2A Given a directed acyclic graph (DAG) of *n* nodes labeled from 0 to *n* - 1, find all possible paths from node 0 to node *n* - 1 and return them in any order. Write JAVA programs for this and calculate time complexity of your solution. **05**

The graph is given as follows: graph[*i*] is a list of all nodes you can visit from node *i* (i.e., there is a directed edge from node *i* to node graph[*i*][*j*]).

Example: source 0 Destination 4



Input: graph = [[4,3,1], [3,2,4],[3], [4], []]

Output: all possible path from 0 to 4 are-

0->4

0->3->4

0->1->3->4

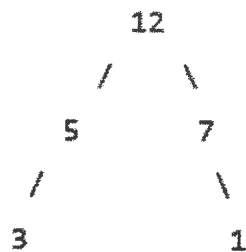
0->1->2->3->4

0->1->4

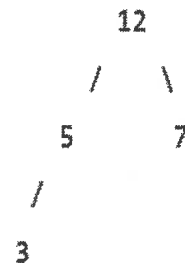
OR

Q.2B Write a JAVA program which will check if all leaves are at same level or not for the given Binary Tree. Also Mention time and space complexity of your code

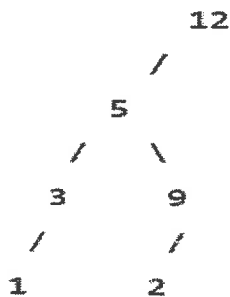
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Output: Leaves are at same level



Output: Leaves are Not at same level

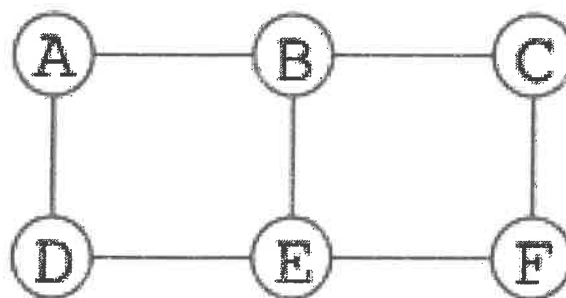


Output: Leaves are at same level

Q.3A Write Java Program to count and print cycles in the given undirected and unweighted Graph using Graph traversal techniques.

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Input -



Output -

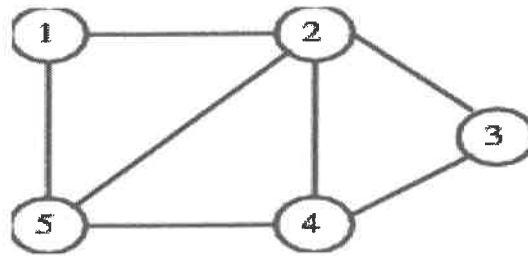
A->B->C->F->E->D->A

A->B->E->D->A

B->C->F->E->B

Total Cycles 3

Input -



Output-

1->2->5->1

2->5->4->2

3->4->2->3

1->2->3->4->5->1

Total cycles 4

OR

Q.3B

Assume that you have a block weighing 40 kg and have tools to divide it as you want. Now, your task is to cut that block into 4 pieces such that only using those 4 pieces and a two-way balancing pan, you can measure any weight from 1 kg to 40 kg? (You should be able to measure any weight like 1 kg, 2 kg, 3kg, 4kg and 5 kg up to 40 kg).

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Which approach you will use for the problem? Write algorithm with constant or logarithmic time complexity for the above problem?

Q.4A

Given a random array `arr[]` of distinct integers. Write Java Method that will sort the array into a wave-like array and return it. In other words, arrange the elements into a sequence such that `arr[1] >= arr[2] <= arr[3] >= arr[4] <= arr[5]..` Also mention time complexity of your solution.

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Example 1-

Input:

N = 7

Input: A[] = [4, 2, 9, 1, 21, 43, 24]

Output A[]: [2, 1, 9, 4, 24, 21, 43]

Explanation: In the above example, you can see `2 >= 1 <= 9 >= 4 <= 24 >= 21 <= 43`.

Example 2-

N = 6

Input: A[] = [20, 10, 8, 6, 4, 2]

Output: A[] = [20, 8, 10, 4, 6, 2] or [10, 8, 20, 2, 6, 4]

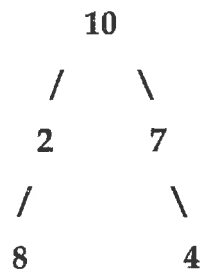
Q.4B Given a Binary Tree convert it to a Binary Search Tree. The conversion must be done in such a way that keeps the original structure of Binary Tree. Write JAVA program for this.

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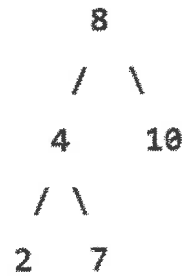
Examples

Example 1

Input:

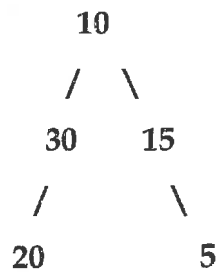


Output:



Example 2

Input:



Output:

