Modern Education Society's

NOWROSJEE WADIA COLLEGE,PUNE-1

(An Autonomous College under Savitribai Phule Pune University)

M.Sc. (Computer Science) Part I Sem I (NEP)

External Practical Examination Nov / Dec 2024

PCSMJ116B: Laboratory Course on Design and Analysis of Algorithms

Time: 2 hours **Max. Marks: 35**

Q.1.Write a Scilab program to sort a random array of n integers (accept the value of n from user) in ascending order by using a counting sort algorithm. [10M]

Pseudocode :

1. Accept the number of elements `n` from the user.
2. Accept the array of `n` integers.
3. Find the maximum value `maxVal` in the array.
4. Initialize an array `count[]` of size `maxVal + 1` with all values set to 0.
5. For each element `elem` in the input array:
   a. Increment `count[elem]` by 1.
6. Modify the `count[]` array to store the cumulative count:
   a. For i = 1 to maxVal:
      i. Set `count[i] = count[i] + count[i-1]`.
7. Initialize an array `output[]` of size `n`.
8. For i = n down to 1:
   a. Set `output[count[arr[i]] - 1] = arr[i]`.
   b. Decrement `count[arr[i]]` by 1.
9. Copy the contents of `output[]` to the original array `arr[]`.
10. Display the sorted array.

Q.2. Write a Scilab program to find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm. [20M]

Pseudocode :

1. Initialize a graph with N vertices and the edge weights.
2. Initialize:
   a. A parent[ ] array to store the parent of each node in the MST.
   b. A key[ ] array to store the minimum edge weight to connect each node to the MST.
   c. A visited[ ] array to keep track of the nodes included in the MST.
3. Set the key value for the starting node (arbitrary node, say node 1) to 0 and all other key values to infinity (∞).
4. For i = 1 to N:
   a. Find the vertex u with the minimum key value that is not yet included in the MST.
   b. Mark vertex u as visited.

c. For each adjacent vertex v of u:
If v is not visited and the weight of edge (u, v) is less than key[v]:

- Update key[v] = weight of edge (u, v)

- Set parent[v] = u

5. After the loop, print the edges of the MST by using the parent[ ] array and key[ ] array to display the minimum cost spanning tree.

Q.3. Viva **[5M]**

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