Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2023

DATA STRUCTURES & ALGORITHMS [ELE 4078]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 07 December 2023** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

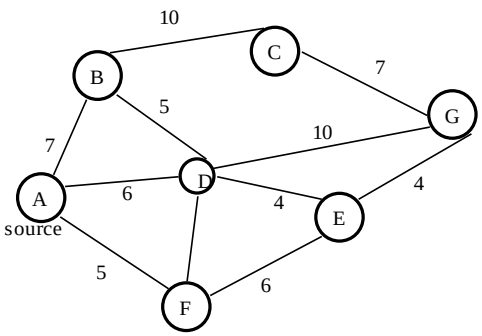
1A. What is the output of the following pseudocode.

```
Integer a, b, c
Set b = 0, c = 0
for(each a from 1 to 5)
  print c
  b = b + 1
  c = c + b
end for
```

(02)

1B. It is required to have a change for ₹ 9, and an infinite supply of coins of denominations {1, 2, 5} is available. In how many ways can the change be made? Also, determine the minimum no of coins to be given as change with their denominations. The order of coins doesn't matter. Solve the problem using the Dynamic programming technique. Also, write the algorithm. Show all the steps clearly. ***(05)***

1C. Analyze the given Graph and obtain the shortest path from the source node to all other nodes in the given graph using Dijkstra's algorithm. Write the pseudo code and show all the steps clearly. The contents of *reached*, *distance,* and *previous* arrays must be shown clearly.



(03)

2A. What is a spanning tree and minimum spanning tree? List any two applications of this concept in real life. ***(02)***

2B. Solve the recurrence relation and determine the time complexity using i) Substitution method ii) Master's theorem

Write the steps clearly. Assume $2^k=n$

$T(n)=128\ T(n/2) + 6n$; where $n>1$

$=1$ $n=1$ ***(05)***

2C. Infer the goals of algorithmic analysis and asymptotic notations? ***(03)***

3A. List the basic difference between Prim's algorithm and Kruskal's algorithm? ***(02)***

3B. Using hash function f(x)= x mod 9, develop the hash table by inserting the following elements; N=9

55,71,84,8,97,62,53,13,34

Use the following collision handling techniques.

i. Open hashing

ii. Linear Probing

iii. Quadratic Probing

(05)

3C Construct a binary tree using the following data.

In order: [d,e,g,f,h,b,a,c]
Post order: [g,h,f,e,d,b,c,a]

(03)

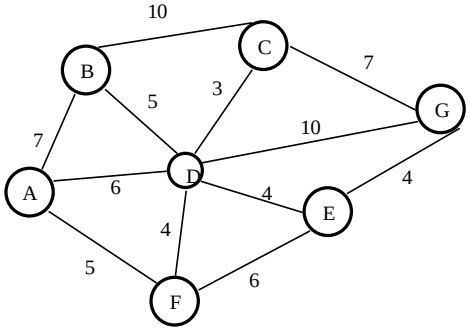
4A. Develop the pseudocode to remove duplicates from a sorted array and give the output as shown below.

Input: {1, 1, 2, 3, 3, 6, 6, 7,7,8}
Output: {1, 2, 3, 6, 7, 8}

(03)

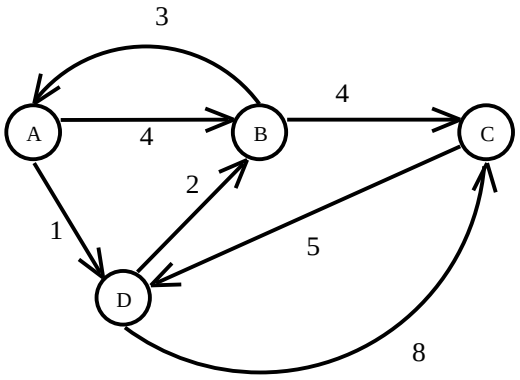
4B Write pseudo codes to implement PUSH and POP operations in a stack. ***(02)***

4C. Analyze the given weighted graph and estimate the minimum spanning tree using Kruskal's algorithm. Write the pseudo-code and show the steps clearly.



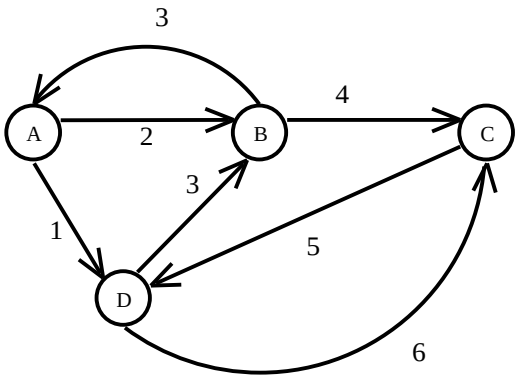
(05)

5A. Determine the shortest distance between cities A and C using Dynamic Programming technique. Show the steps clearly.



(03)

5B. Analyze the following graph and determine technique the shortest distance between city A and C, using the Greedy Technique? Show the steps clearly.



(02)

5C. Estimate the maximum profit using Dynamic programming. Show the steps clearly.

C= 120; W=[20,30,40,50,60]; P= [10,20,25,30,50] ***(05)***