Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER M. TECH. (CSE/CSIS)

END SEMESTER EXAMINATIONS, FEBRUARY 2021

SUBJECT: ADVANCED DATA STRUCTURES AND ALGORITHMS [CSE 5152]

REVISED CREDIT SYSTEM

(22/02/2021)

Time: 3 Hours Max. Marks: 50

Instructions to Candidates:

• Answer **ALL** questions & missing data may be suitably assumed.

1.A. i)Construct a B-tree with the following keys. 5M

5, 3, 21, 9, 1, 13, 2, 7, 10, 12, 4. [minimum degree t=2]

ii)delete the elements 12,10,13,21 from B-Tree of (i)

iii)Find the minimum number of elements that can be stored in a B Tree of height 'h' with minimum degree 2. Illustrate the answer.

1.B. Illustrate the computation of amortized cost of the insertion in a dynamic table for the two cases. 3M

1.C. Consider a sequence having $\frac{n}{2}$ increments followed by $\frac{n}{2}$ increments and decrements happen alternately. Compute the amortized cost of the operations using potential function method. 2M

2.A Write an algorithm to extract the minimum from Binomial heap. Perform the UNION operation on the binomial heaps H1 and H2 given in figure-1. 5M

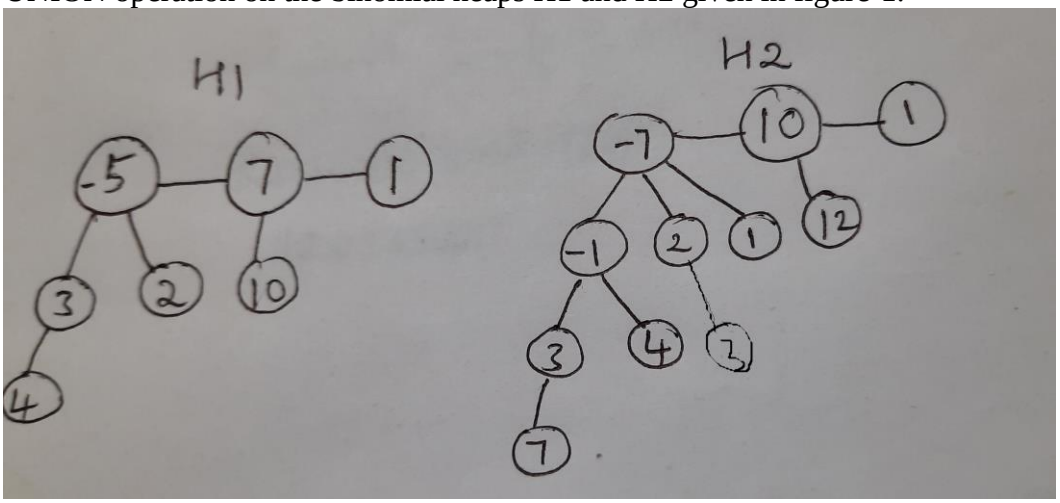

Figure-1

2.B Write an algorithm to search for an element in a B-Tree. Illustrate the operation with an example. 3M

2.C. List the structural properties of a Binomial tree. 2M

3.A. Extract minimum from the Fibonacci heap given in the Figure. 2. 5M

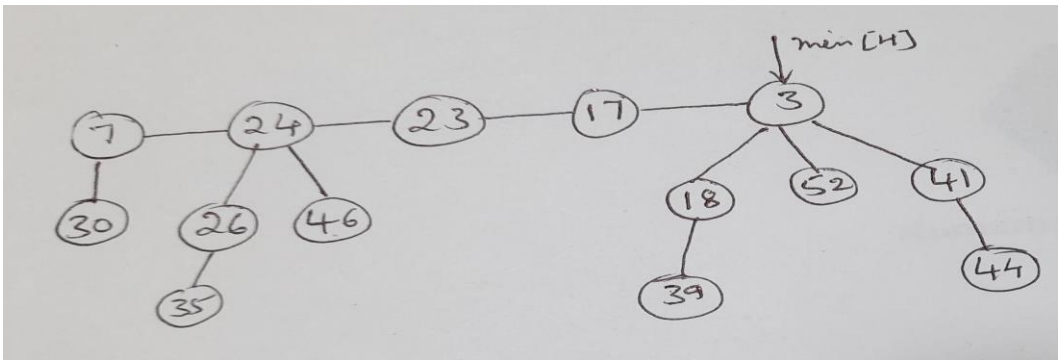

Figure. 2

3.B. i)Construct a Binomial heap for the following list by inserting all the keys in order. Show all the steps. 3M

13, 8, 24, 37, 53, 59, 62, 6, 5, 7, 19, 63.

ii) Decrease the key of node with value 62 by 22.

3.C Compute the efficiency class of the delete operation in van Emde Boas tree. 2M

4.A. Apply Bellman-Ford algorithm to the graph shown in Figure-3 to find the shortest path from '**C**' to all other vertices. Show all the steps. 5M

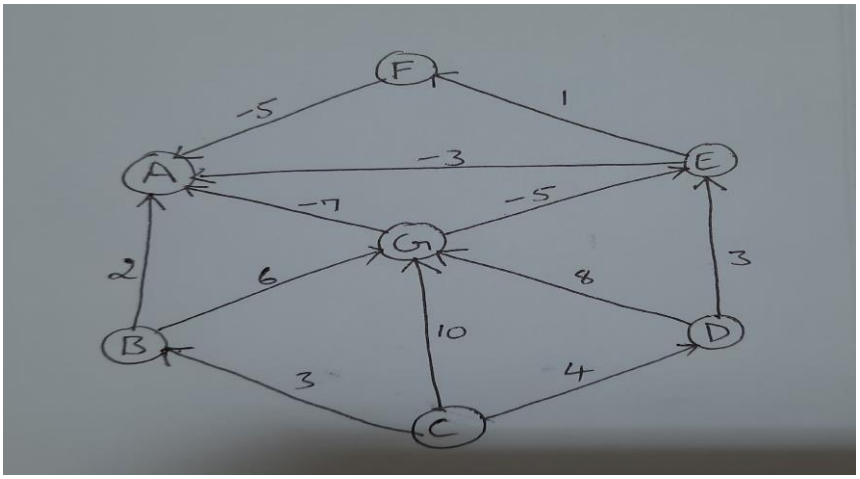

Figure-3

4.B. Show the ordering of vertices produced by TOPOLOGICAL-SORT algorithm when it is run on the DAG of Figure-4. Show all the steps. 3M

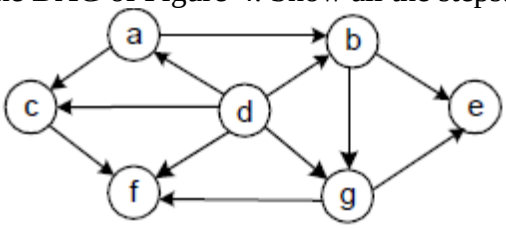

Figure-4

4.C. Write Floyd-Warshall's algorithm. 2M

5.A. Apply Johnson's algorithm to find the shortest path between every pair of vertices 5M

for graph in figure-5. Compute the time complexity the algorithm.

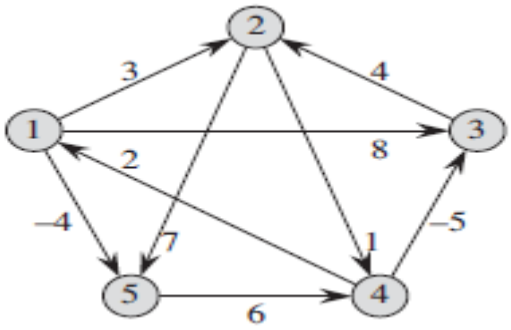

Figure-5

5.B. Find the maximum flow through the given network in Figure-6 using Ford-Fulkerson algorithm. 3M

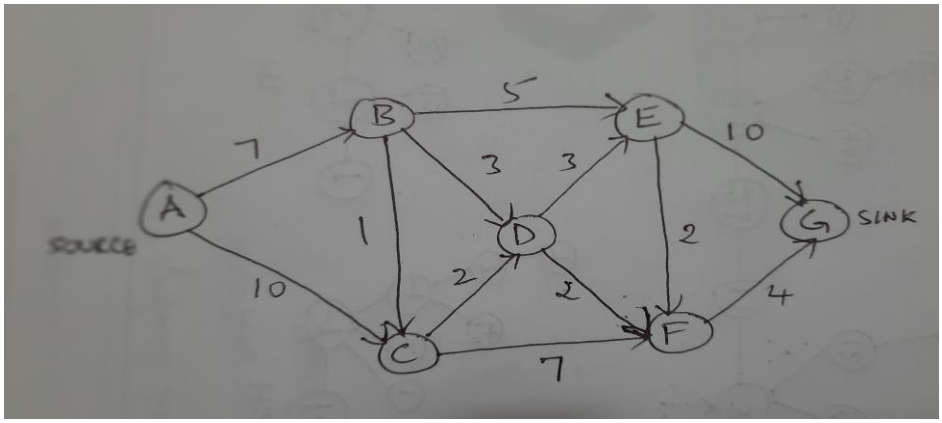

Figure-6

5.C. List and explain the advantages of dynamic multithreaded programming. 2M