Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

I SEMESTER M.TECH. (CSE/CSIS)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: ADVANCED DATA STRUCTURES AND ALGORITHMS [CSE5101]

REVISED CREDIT SYSTEM (24/11/2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** questions.
- Missing data may be suitable assumed.

1A. Write an algorithm for incrementing the k-bit binary number by 1 and also find its worst case complexity. If n times an increment operation is applied on an initially zero counter then find the amortized cost. **3**

1B. List all the properties of the Binomial tree and also construct a Binomial heap with 28 nodes assuming suitable data. **2**

1C. Explain the steps to be followed to delete any key in B-tree. Delete in order the keys in the B-tree with minimum degree3 given in Fig.Q1C (i) P (ii) X (iii) M **5**

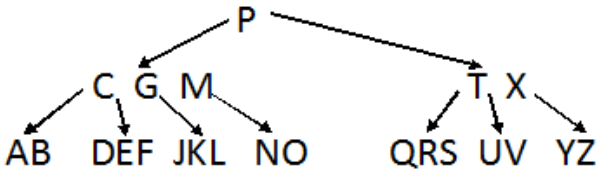

Fig Q1C

2A. Write an algorithm for extracting the minimum node in Fibonacci heap and also find its amortized cost . **4**

2B. Extract the second minimum from the Binomial heap given in Fig Q2B by indicating all the steps. **4**

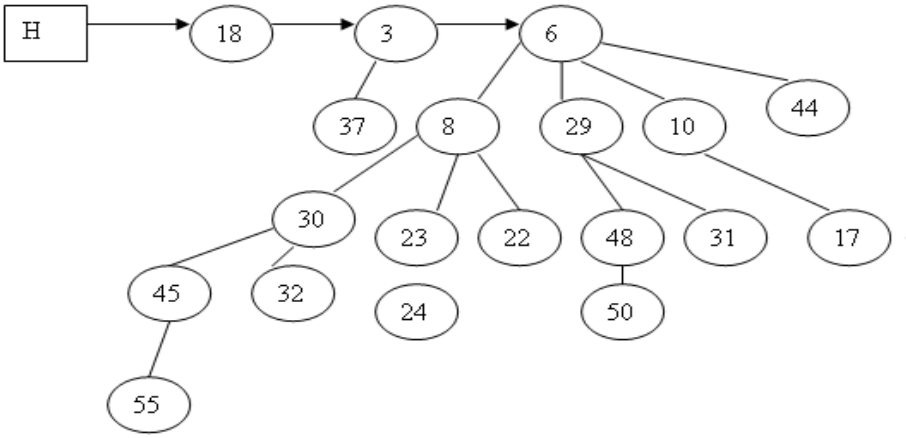

Fig Q2B

2C. Superimpose a binary tree of bits on top of a bit vector representing the set [1; 2; 3; 6; 7; 12; 14] when the universal set u = 16. Give the method for finding (i) minimum and (ii) predecessor of 14. **2**

3A. Let x be any node in a Fibonacci heap and **k = degree[x]** , then prove that **size(x) ≥ F_{k+2} ≥ ϕ^k** where **ϕ** = 1.61803 **3**

3B. Discuss the concept of union of two disjoint sets and also find the amortized cost of sequence of n make set operations followed by (n**-**1) union operations. **2**

3C. Write Bellmann Ford Algorithm and execute the Jhonson's Algorithm on the graph given Fig Q3C to find the shortest path from the vertex X to all the vertices. **5**

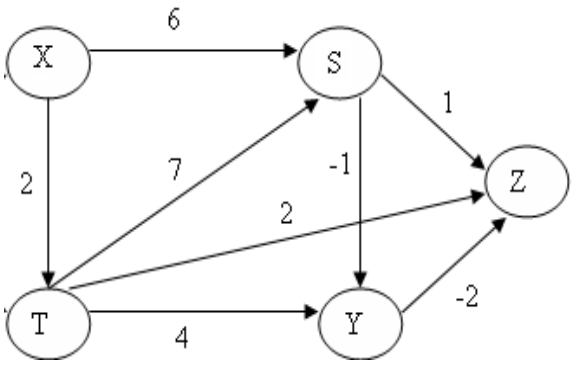

Fig Q3C

4A. Write the algorithm for finding shortest path from the source to all the vertices using DAG and execute the same on the graph given in Fig Q4A.Assume that A is the source vertex. **4**

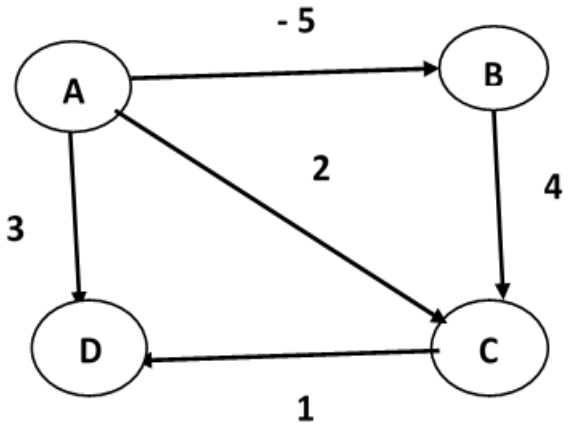

Fig Q4A

4B. If the adjacency matrix of a graph is given in the Fig,Q4B. Use Faster all pairs shortest path algorithm to find all pairs shortest paths by considering at most 2 edges. **3**

0	∞	∞	∞	**-1**	∞
1	0	∞	2	∞	∞
∞	2	0	∞	∞	-8
-4	∞	∞	0	3	∞
∞	7	∞	∞	0	∞
∞	5	10	∞	∞	0

Fig Q4B

4C. If the distance matrix of the graph with zero intermediate vertex is as given in the Fig Q4C. Find the $d_{13}^{(1)}$, $d_{21}^{(1)}$ and $d_{\mathbf{23}}^{(1)}$ **3**

0	3	8	4	**-**4
∞	0	∞	1	7
∞	4	0	5	11
2	-1	-5	0	2
∞	∞	∞	6	-2

Fig Q4C

5A. Discuss the concept of proto van Emde Boas tree and draw the same for the universal size=16 for the dynamic set{2,3,4,5,7,14,15} **4**

5B. What is dynamic multithreaded programming and list out its advantages. Write the same for generating Fibonacci sequence. **4**

5C Discuss the concept of networks with multiple sources and sinks **2**