

1st Semester Regular/Back Examination 2017-18

Advanced Data Structure and Algorithms

BRANCH: COMPUTER SCIENCE, COMPUTER SCIENCE AND ENGG, INFORMATION
TECH.

Time: 3 Hours

Max Marks: 100

Q.CODE: B990

Answer Question No.1 which is compulsory and any FOUR from the rest.

The figures in the right hand margin indicate marks.

Q1 Answer the following questions: *Short answer type*

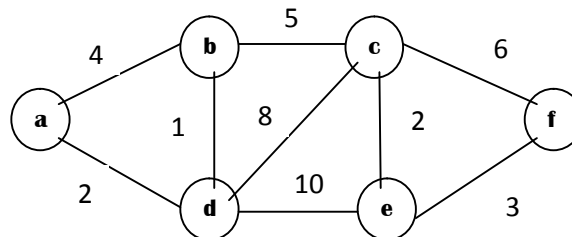
(2 x 10)

- Define a segment tree with example.
- What are Binomial Heaps? What are its applications?
- Define time complexity of an algorithm.
- Differentiate best case and worst case time complexity.
- What is TV-tree? Give an example.
- Define asymptotic notations.
- Prove that $5n^2 + 6n + 7 = \Omega(n^2)$.
- Explain NP Hard and NP Complete problem.
- What is the space complexity of following algorithm?

```
void N()
{
    int P,A,B,C;
    P= A+B-C;
    printf("%d", P)
}
```

- Illustrate the steps involved in analyzing using an example algorithm.

Q2 a) Write Dijkstra's algorithm and use it to find single source shortest path for the following graph: (10)



- What is a red-black tree? Draw a red-black tree using following datasets: 8, 18, 5, 15, 17, 25, 40, 62, 78, and 90. (10)

Q3 a) Define LCS algorithm. Find the longest common subsequence in "acbaedgh" and "habcadfg". (10)

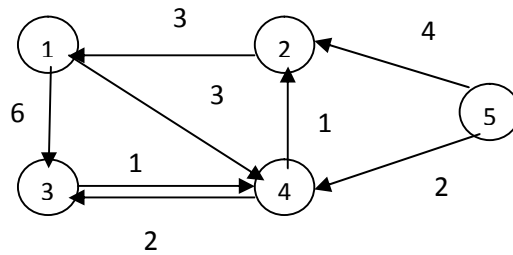
- Explain dynamic programming with example. (10)

Q4 a) Solve the following knapsack problem with given capacity $W=5$ using dynamic programming: (10)

Item	Weight	Value
1	2	\$12
2	1	\$10
3	3	\$20
4	2	\$15

- Create a B-tree of order 5 from the following data sets: 15, 20, 35, 95, 13, 10, 50, 65, 5, 70, 30, 40, 45, 80, 25, 6, 22 and 33. (10)

- Q5** a) State and prove the Cook's theorems. (10)
b) Use Floyd-Warshall Algorithm in the following directed graph: (10)



- Q6** a) What is the difference between binomial heaps and lazy binomial heaps? Give example. (10)
b) What is a trie data structure? Construct a trie that stores the following keys: AEROPLANE, BICYCLE, BIKE, BUS, CAR, CARRIAGE, and TRAIN. (10)
- Q7** a) Write matrix chain multiplication algorithm by using dynamic programming approach. Find the optimal sequence of matrix multiplication for the dimensions of matrices $\langle 5, 4, 6, 2, 7 \rangle$. (10)
b) What do you mean by order of growth function? Arrange the following functions in increasing order $n \log n$, n^2 , $n!$, 2^n , $\log n$. (10)