

**Government College of Engineering, Amravati**  
(An Autonomous Institute of Government of Maharashtra)

**Sixth Semester B. Tech. (CS / IT)**

**Summer – 2016**

**Course Code: ITU601**

**Course Name: Design and Analysis of Algorithms**

**Time: 2: 30Hr**

**Max. Marks: 60**

**Instructions to Candidate**

- 1) All questions are compulsory.
- 2) Assume suitable data wherever necessary and clearly state the assumptions made.
- 3) Diagrams/sketches should be given wherever necessary.
- 4) Figures to the right indicate full marks.

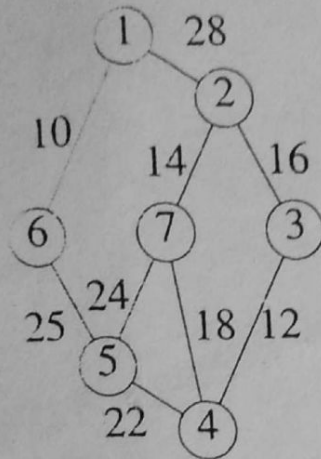
**1 Solve any TWO**

- a** What is sequencing in the analysis of control structure and provide detail algorithmic analysis of “for loops”. **6**
- b** Define asymptotic notations for worst case, best case and average case time complexities. Give examples **6**
- c** Solve the recurrence equation **6**  
$$T(n) = \begin{cases} 1/4 & \text{if } n=1 \\ n.T^3(n/2) & \text{otherwise} \end{cases}$$

2.

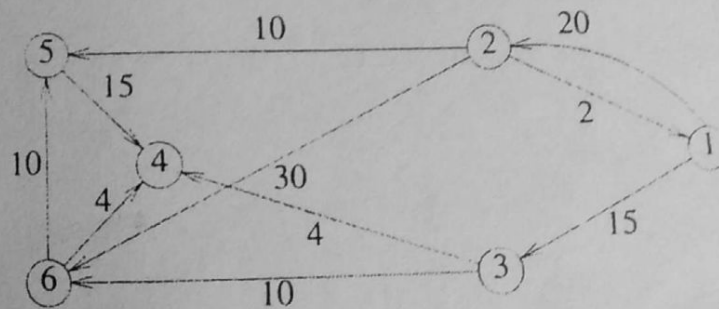
**Solve any two.**

- a Derive the Prim's algorithm greedy method to obtain a minimum-cost spanning tree. Build this given tree edge by edge



b

algorithm to generate shortest paths. Illustrate with the given graph start from vertex 1.



c

or the knapsack problem and find optimal solution to the knapsack instance  $n = 3$ ,  $m = 20$   
 $(p_1, p_2, p_3) = (25, 24, 15)$  and  
 $(w_1, w_2, w_3) = (18, 15, 10)$

3

**Solve any two**

- a Consider a set of 14 element in an array list the elements of array that require the largest number key comparisons when searched for by binary search. Find the average number of keys comparisons made by binary search in successful search and unsuccessful search in this array.

**b** Write the merge sort algorithm and discuss its efficiency. Sort the list E, X, A, M, P, L, E in alphabetical order using merge sort. **6**

**c** Write the selection sort algorithm. Show that its worst case time complexity is  $O(n^2)$  **6**

**4** **Solve the following.**

**a** Explain the principle of ordering Chain matrix multiplication in the light of Dynamic programming. Find an optimal way to find product ABCDEF of matrix **6**

$[A]_{30 \times 35}, [B]_{35 \times 15}, [C]_{15 \times 5}, [D]_{5 \times 10}, [E]_{10 \times 20}, [F]_{20 \times 25}$

**b** Explain the difference between depth first search and breadth first search with proper example. **6**

**5** **Solve the following**

**a** Briefly explain the relationship between P, NP, NP complete and NP-hard problems. **6**

**b** Prove that SAT-3 CNF is NP Complete problem. **6**