

**III B.Tech I Semester Regular Examinations, Nov/Dec 2009**  
**DESIGN AND ANALYSIS OF ALGORITHMS**  
**Computer Science And Engineering**

**Time: 3 hours****Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) What puts a problem into class NP.  
(b) Explain the differences between decision and optimization problems. [8+8]
2. Explain the principles of:
  - (a) Control Abstraction for LC-search.
  - (b) Bounding.
  - (c) FIFO Branch & Bound.
  - (d) LIFO Branch & Bound. [16]
3. Write recursive and iterative versions of General Backtracking algorithm. Also explain with an example. [16]
4. Explain Aggregate method, Accounting method and Potential Method to find amortized costs of an algorithm. [16]
5. Design an algorithm for finding a maximum spanning tree (a spanning tree with the largest possible edge weight ) of a weighted connected graph. [16]
6. (a) Solve the following 0/1 Knapsack problem using dynamic programming where array of profits is  $P = (11, 21, 31, 33)$  and array of weights is  $W = (2, 11, 22, 15)$ , Knapsack capacity is  $M = 40$  and number of items is  $n = 4$ .  
(b) Construct an optimal binary search tree for the following data:  $n = 4$ ,  $(a_1, a_2, a_3, a_4) = (\text{do, if, int, while})$ ,  $p(1:4) = (3, 3, 1, 1)$  and  $q(0:4) = (2, 3, 1, 1, 1)$ . [8+8]
7. The  $k$ th quantiles of an  $n$ -element set are the  $(k-1)$  elements from the set that divide the sorted set into  $k$  equal sized sets. Give an algorithm to list the  $k$ th quantiles of a set. [16]
8. Suppose we want to find the minimum spanning tree of the following graph 2.
  - (a) Run Prim's algorithm; whenever there is a choice of nodes, always use alphabetic ordering (e.g., start from node A). Draw a table showing the intermediate values of the cost array.
  - (b) Run Kruskal's algorithm on the same graph. Show how the disjoint-sets data structure looks at every intermediate stage (including the structure of the directed trees), assuming path compression is used. [8+8]

Code No: 45015

R07

Set No - 4

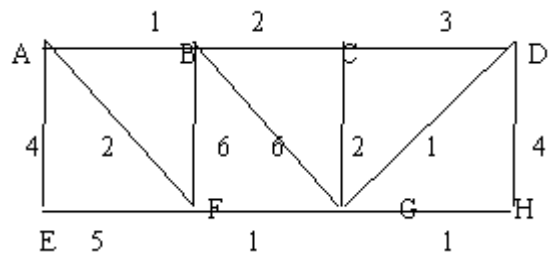


Figure 2: