ALCCS

Time: 3 Hours   **JUNE 2017**   **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:
- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**

Q.1 a. Define Big-Oh and Big Theta with example.

  b. Define Hamiltonian cycle. Proof that Hamiltonian cycle always exists in complete graph.

  c. What is heap? Write time complexity of heap sort.

  d. Compare quicksort and mergesort in terms of time and space complexity.

  e. Justify how variable length codes give better compression than fixed length codes.

  f. Write Floyd-Warshall algorithm for all pair shortest path.

  g. Define NP and NP-complete problem.   **(7 × 4)**

Q.2 a. Write an algorithm to search an element in an array and prove that it is a finite time algorithm.   **(4+4)**

  b. Write implicit and explicit constrains for 8-queen problem.   **(4+4)**

  c. Write recurrence relation for binary search.   **(2)**

Q.3 a. Define length of path with example.   **(2)**

  b. Which data structure is required in breadth first search? Describe how this data structure is used in breadth first search.   **(2+6)**

  c. Define a graph in terms of adjacency matrix and adjacency list taking an example.
                                                                          (4+4)

Q.4 a. Write algorithm for quicksort and analyze it for best and worst case.   **(5+4)**

  b. Define various properties of B-tree.   **(9)**

Q.5 a. Given a knapsack of capacity m=30. Find maximum profit achieved by greedy approach.   **(4)**
     (p1,p2,p3,p4)=(50,140,60,60) and (w1,w2,w3,w4)=(5,20,10,12)

b. Discuss merits of prims algorithm over kruskal algorithm with example.   **(5)**

c. How 6 matrices $A_1, A_2, A_3, A_4, A_5, A_6$ of dimensions 30, 35, 15, 5, 10, 20, 25 can be multiplied optimally using dynamic programming.   **(9)**

Q.6   a. Find shortest path from vertex 1 in given graph using Dijkstra algorithm   **(8)**
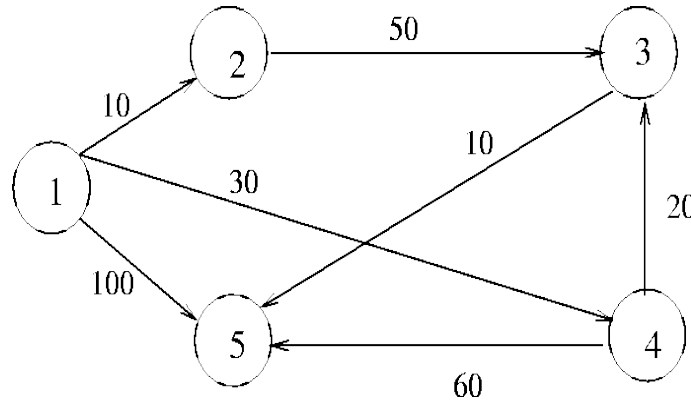
b. Find a minimum cut in the following basic network: **(4)**
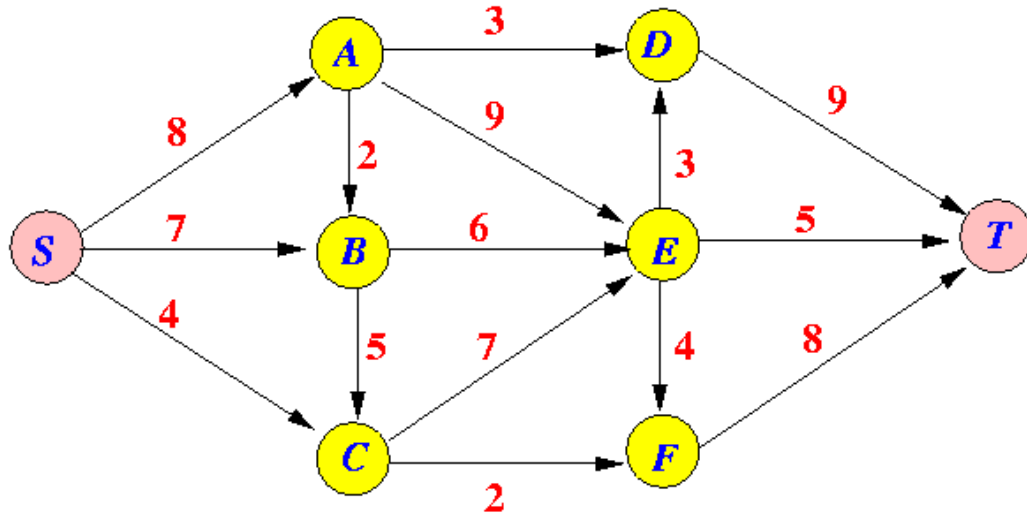
c. Compare divide and conquer, greedy and dynamic programming approach.   **(6)**

Q.7   a. Write two advantages and disadvantages of Knuth Morris Pratt (KMP) algorithm over Rabin Karp.   **(6)**

b. Write algorithm to find prefix function in KMP algorithm. Also find prefix function for string ababababca.   **(4+4)**

c. Define 3- SAT. Prove that it is polynomial time verifiable.   **(4)**