CSE317 Design & Analysis of Algorithms

Institute of Business Administration Karachi
Leadership and Ideas for Tomorrow

Second Term Examination – Fall'17

Max Marks: 15 Duration: 1½ hours

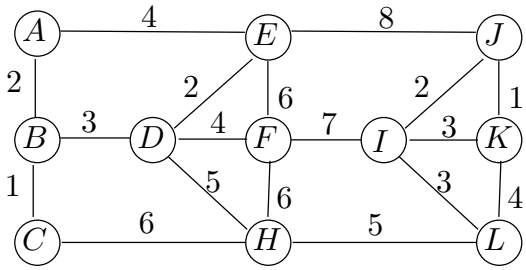
IBA FCS Faculty of Computer Science

Answer all questions. Use seperate answer sheet. Be to the point. Show your work.
Please give clear and rigorous answers.

Name: _____ **ERP:** _____

Question 1: Greedy Algorithms ..... *6 marks*

(a) [4 marks] Consider the weighted graph below.



i. Run Prim's algorithm starting from vertex A. Write the edges in the order which they are added to the minimum spanning tree.

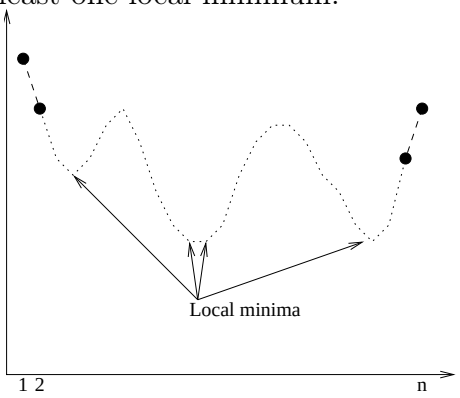
ii. Run Kruskal's algorithm. Write the edges in the order which they are added to the minimum spanning tree.

iii. What is the total weight of minimum spanning tree in this graph?

(b) [2 marks] Prove that if the weights of the edges of a connected graph G are distinct, then G has a unique minimum spanning tree.

Question 2: Divide & Conquer ..... *5 marks*

(a) [3 marks] In this problem we consider an array A of length n for which we know that $A[1] \geq A[2]$ and $A[n-1] \leq A[n]$. We say that $A[x]$ is a *local minimum* if $A[x-1] \geq A[x]$ and $A[x] \leq A[x+1]$. Note that A must have at least one local minimum.



We can obviously find a local minimum in $O(n)$ time by scanning through A. Describe an $O(\log n)$ algorithm for finding a local minimum.

(b) [2 marks] Solve the recurrence: $T(n) = 3T(n/4) + n$ using master theorem.

Question 3: Dynamic Programming ..... *4 marks*

In this question we will compute edit-distance between the strings X = *your-firstname* and Y = *lastname*.

(a) [1 mark] Write the recurrence for computing the optimal cost of a problem given the optimal solution of relevant subproblems. How many subproblems we get?

(b) [3 marks] Fill in the appropriate table using the recurrence from previous part. (If your first-name or last-name have more than 5 letters then consider the first 5 letters only).