National University of Computer & Emerging Sciences, Karachi
Fall-2017 Department of Computer Science
Mid Term - 2
24th October 2017, 11:00 am– 12:00 noon

Course Code: CS302	**Course Name:** Design and Analysis of Algorithm
Instructor Name / Names: Dr. Muhammad Atif Tahir, Subhash Sagar and Zeshan Khan	
Student Roll No:	**Section:**

Instructions:

- Return the question paper.
- Read each question completely before answering it. There are **4 questions and 2 pages.**
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.

Time: 60 minutes. **Max Marks**: 10 points

Question 1 (2 Points)

Apply BFS(A), BFS(F), DFS(A), DFS(G) in Graph shown in Figure 1. Show all steps showing Queues and Visit Order. BFS(A) means find BFS for Vertex A. [2 Points]

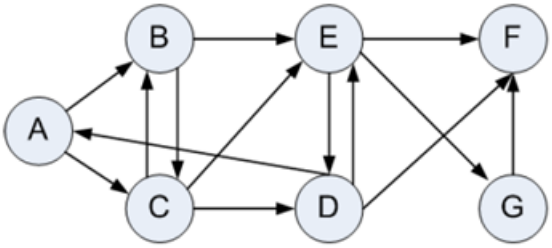

Figure1: Graph for BFS and DFS.

Question 2 (2 Points):

Given any connected undirected graph G with positive edge weights w, does there always exist a single shortest path tree S such that S is also a minimum spanning tree (MST) of G?(**Yes/No**) Prove your answer by giving an example of graph. (**Note.** Graph must have at least 4 vertices).

Question 3 (3 Points)

Travel Agency wants to setup a public transport system between all the cities. The passenger fare in rupees between the cities are shown in the **Figure-2**. How should all cities be linked to maximize the total fare. [Hint: Use Spanning Tree]

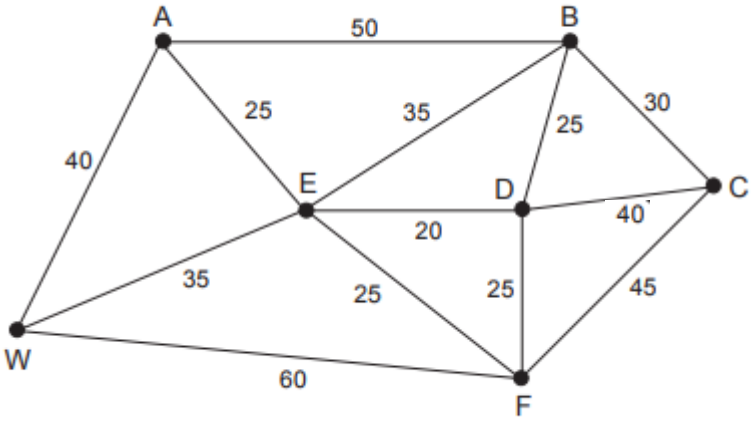

Figure-2

Question 4 (3 Points)

Consider the following instance of the 0,1 knapsack problem

Item	1	2	3	4	5
Benefit	2	6	1	8	5
Weight	1	1	2	3	2

The maximum allowable total weight in the knapsack is W = 5.

Find an optimal solution for the above problem with the weights and benefits above using Dynamic Programming. Be sure to state both the value of the maximum benefit that you obtain as well as the item(s) that you need to obtain this benefit. Show all steps.