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

Instructions:
- Return the question paper.
- Read each question completely before answering it. There are **5 questions** on **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: 12.5**

Question # 1   **[2 marks]**

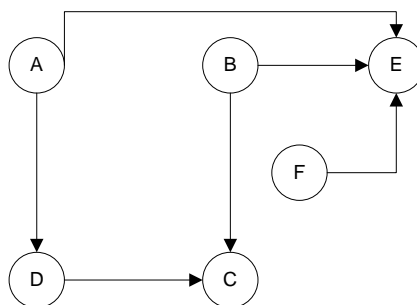Use Topological Sort to determine whether **Figure: 1** is a Directed Acyclic Graph (DAG) or not. Show all steps.

Figure: 1

Question # 2   **[3+1=4 marks]**

(a) Execute the following dynamic programming algorithm on the provided input strings X and Y and show the output with intermediate steps.

X=ACTCSSSAAA

Y=ACCSGSSAAA

Z is a matrix of size (m+1)*(n+1) for results of the provided algorithm. Here *m* is the length of sequence (string) X and *n* is the size of sequence Y.

$$Z[i,j] = \begin{cases} Z[i-1,j-1]+1 & if\,(i > 0 \,\&\&\, j > 0 \,\&\&\, X[i] = Y[j]) \\ \max(Z[i-1,j], Z[i,j-1]) & if\,(i > 0 \,\&\&\, j > 0 \,\&\&\, X[i] \neq Y[j]) \\ 0 & if\,(i = 0 \,||\, j = 0) \end{cases}$$

You are required to fill matrix Z (as provided below) for the above example.

(b) What is going on in this algorithm. Explain in 1-2 sentence, otherwise answer will not be checked.

Question # 3   [1 marks]

Differentiate between greedy and dynamic algorithms.

Question # 4   [0.25*8=2 marks]

Provide the worst case time complexity and the name design technique of the following algorithms.

Algorithm	Worst Case	Write below whether the algorithm belongs to Dynamic Programming / Greedy Algorithms / None of them
0/1 Knapsack using Dynamic Programming		
0/1 Knapsack using Brute Force		
Breadth First Search		
Depth First Search		
Kruskal's algorithm for finding MST		
Prim's algorithm for finding MST		
Matrix Chain Multiplication using Dynamic Programming		
Matrix Chain Multiplication using Brute Force		

Question # 5   [2+1.5=3.5 marks]

A) Design a time efficient algorithm for the computation of **maximum** spanning tree from a provided graph G(V,E).
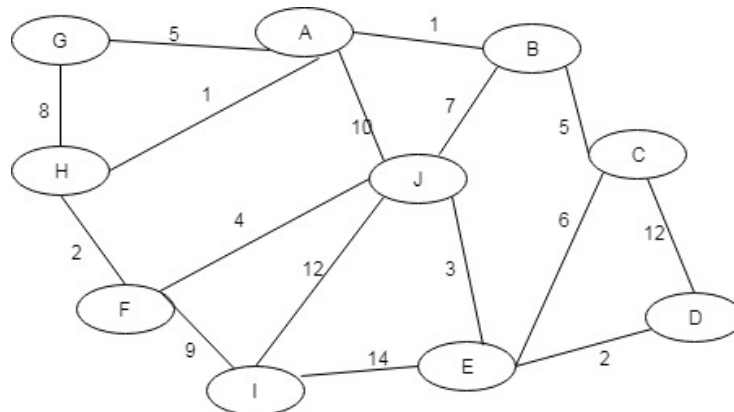B) Apply designed algorithm from (A) on the following graph (**Figure: 2**) to compute the maximum spanning tree:

Figure: 2

BEST OF LUCK