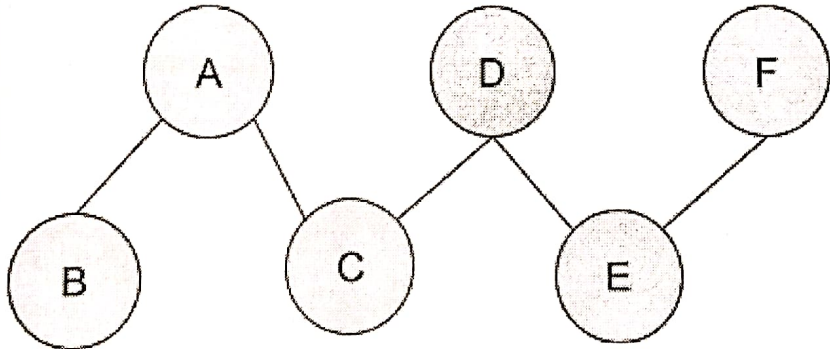




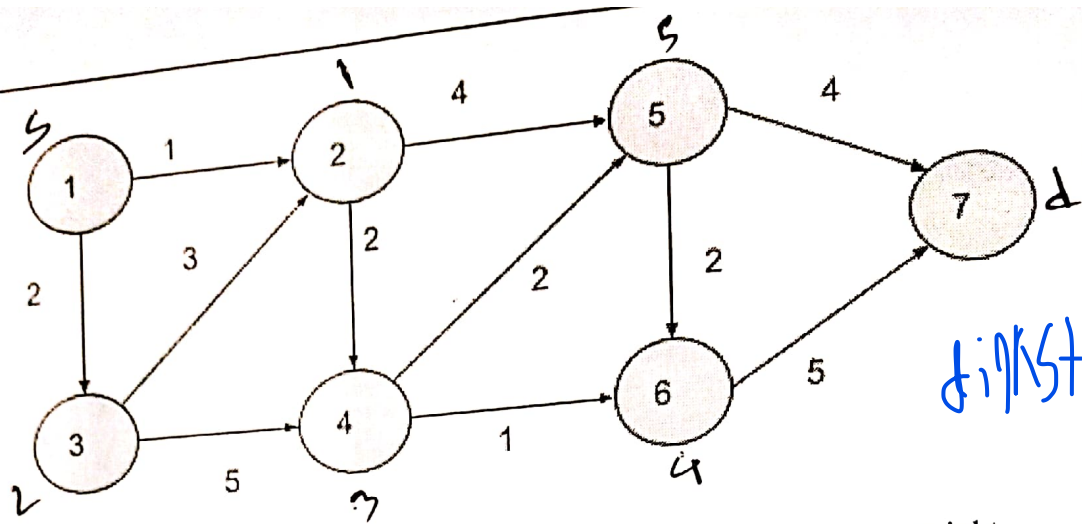
EAST WEST UNIVERSITY

Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
Final Examination, Spring 2022 Semester

Course	CSE 246 Algorithms, Section 04
Instructor	Redwan Ahmed Rizvee
Full Marks	30 (Will be converted to 20)
Time	1 hour 40 minutes
Date	May 19, 2022

1	Look at the following undirected graph, 	CO3
	<p>Design a formal algorithm to find the articulation points or nodes from this graph. Also apply your designed algorithm over the given graph to find such points.</p> <p>An articulation point, is such a point that divides the given graph into two components if that node along with all the adjacent edges connected to it are removed from the graph.</p>	4

2		CO3
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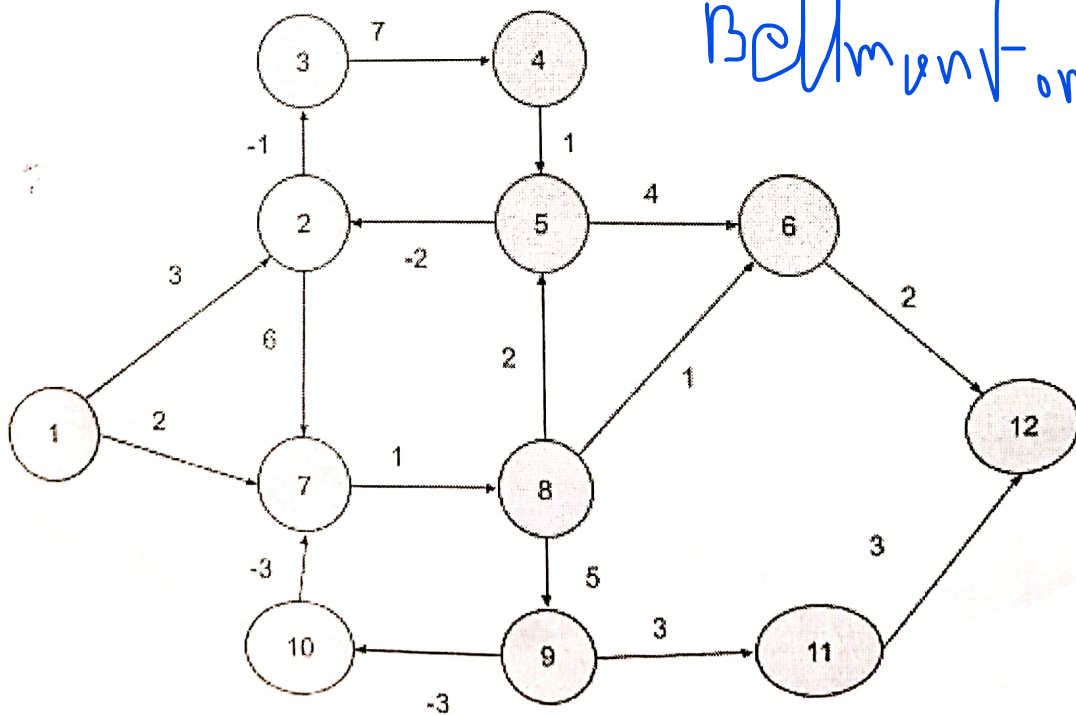


Look at the above directed graph. In the graph, for each edge there is an weight associated which denotes the distance to be covered to reach v from u ($u \rightarrow v$) using that edge. For the given problem, you will consider the node with id 1 and 7 as source and destinate node respectively.

You need to **design** a shortest path algorithm to reach node 7 from node 1 using minimum weight/distance. **Apply** your designed algorithm to solve the problem for the given scenario. Also, **identify** if there lies multiple shortest paths to reach the destination from the source or not. If **exists**, report them.

CO3

Look at the following directed weighted graph.



The graph contains negative weighted edges. For this problem, assume the source and destination nodes as 1 and 12 respectively. **Design** a formal algorithm to calculate the minimum distance to reach the destination node from the source node.

5

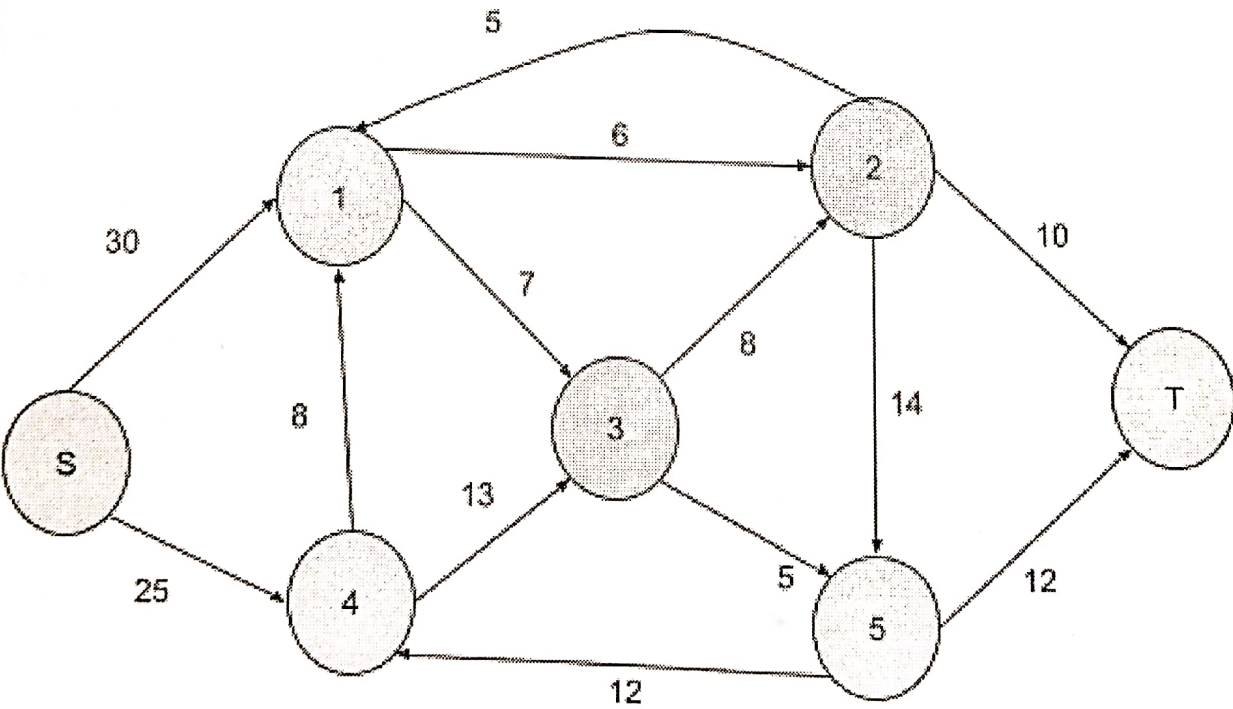
Also apply the designed algorithm over the given graph.

	CO3
<div> </div> <p>Look at the above given directed weighted graph. Design an efficient algorithm to calculate All pair shortest paths' distances. Apply the designed algorithm over the given graph and compute the results.</p>	4

Eligible

	CO3
<div> </div> <p>Look at the following undirected graph.</p> <p>Design an algorithm to calculate the Minimum Spanning Tree (MST) from an undirected weighted graph. Apply the algorithm over the given graph and show the resultant MST.</p>	4

6		CO4
	Design an algorithm to detect if there exists negative cycle(s) from a given weighted directed graph where the weight of an edge denotes the distance between adjacent nodes. Also write an algorithm to identify the nodes that are affected due to the presence of negative cycles.	2
	Design an algorithm to order the edges of a directed weighted graph to run Bellman-Ford Algorithm so that the edges closest to the source are ordered first, then the edges closest to them and so on.	2

7		CO3
	 <p>Look at the above given directed weighted graph where the edge weight denotes the capacity of the maximum flow that can be passed through that edge. Design an algorithm to calculate the maximum flow possible from a given network or graph. Also apply the algorithm over the given graph to calculate the resultant <u>maximum flow</u> from this network.</p>	4



EAST WEST UNIVERSITY

Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
Mid Term II Examination, Spring 2022 Semester

Course	CSE 246 Algorithms, Section 04
Instructor	Redwan Ahmed Rizvee
Full Marks	30 (Will be converted to 20)
Time	1 hour 20 minutes
Date	April 07, 2022

1		CO4																																																																								
	<p>Here you are given the already calculated dp table DP of the 0/1 knapsack problem. You are also given the Knapsack weight W and the corresponding items' information Inf, e.g, weight and profit. From the given information, you need to <u>Identify</u> and <u>justify</u> which items will give the maximum benefit not violating the knapsack weight constraint.</p> <p>DP Table (Row: Weight, Column: Items)</p> <table><tr><th>i/w</th><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>21</td><td>21</td><td>21</td><td>21</td><td>21</td><td>21</td><td>21</td></tr><tr><td>2</td><td>0</td><td>21</td><td>21</td><td>31</td><td>31</td><td>31</td><td>31</td><td>31</td></tr><tr><td>3</td><td>0</td><td>21</td><td>21</td><td>36</td><td>36</td><td>46</td><td>46</td><td>46</td></tr><tr><td>4</td><td>0</td><td>21</td><td>31</td><td>36</td><td>46</td><td>46</td><td>56</td><td>56</td></tr><tr><td>5</td><td>0</td><td>21</td><td>31</td><td>36</td><td>46</td><td>46</td><td>56</td><td>61</td></tr><tr><td>6</td><td>0</td><td>21</td><td>31</td><td>36</td><td>46</td><td>46</td><td>56</td><td>61</td></tr></table> <p><i>item</i></p> <p>W = 7, Inf Table</p>	i/w	0	1	2	3	4	5	6	7	0	0	0	0	0	0	0	0	0	1	0	21	21	21	21	21	21	21	2	0	21	21	31	31	31	31	31	3	0	21	21	36	36	46	46	46	4	0	21	31	36	46	46	56	56	5	0	21	31	36	46	46	56	61	6	0	21	31	36	46	46	56	61	4
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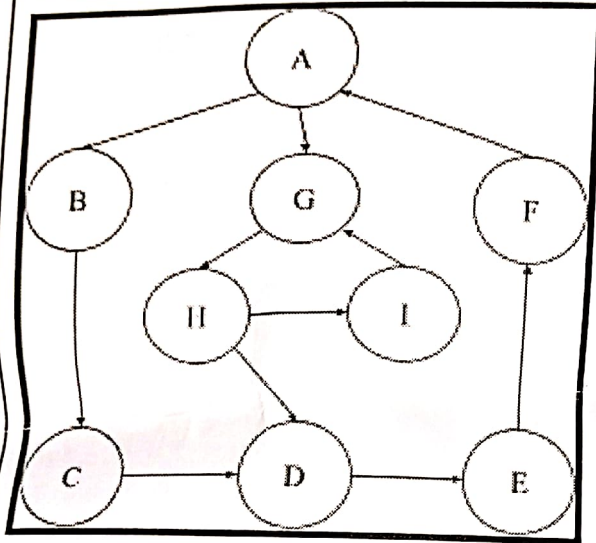
Item	Weight	Value
1	1	21
2	2	10
3	2	15
4	1	10
5	3	15
6	2	10

2		CO3
	You will be given two integers a and b . Design an algorithm to calculate the Greatest Common Divisor (GCD) of the given numbers.	2

3		CO3
	You will be given an integer number N . Design an algorithm to find if the given number is prime or not. No need to write the complete code, rather explain the main idea.	2

4		CO4
	<p>Here, you are given a text T = 'abbbaabbcfabacaf' and a pattern P = 'bba'. You are going to simulate the string matching algorithm <u>Robin-Karp</u> here.</p> <p>For hashing, here the base B will be 2 ($B=2$) and modular value M will be 7 ($M=7$). In the algorithm modular value is used to reduce the case of numeric overflow. For ease, how a hashing is conducted is exemplified below for a pattern P of length m.</p> $\text{Hash}(P) = (B^{(m-1)} P[0] + B^{(m-2)} P[1] + B^{(m-3)} P[2] + \dots + P[m-1]) \% M$ <p>In this problem, you need to simulate if there lies any position(s) in T that might cause problems while finding the occurrences of P in T. Determine the possibility and justify the reasoning behind it. You also need to develop strategies to solve this challenge.</p>	4+1

5		CO4
	In this problem, you will be dealing with EWU's classrooms and stairs.	4



8		CO3
	Given an undirected graph, design an algorithm to detect if there is any cycle in the graph. Also add a logical block in your design to print all the found cycles.	3+2