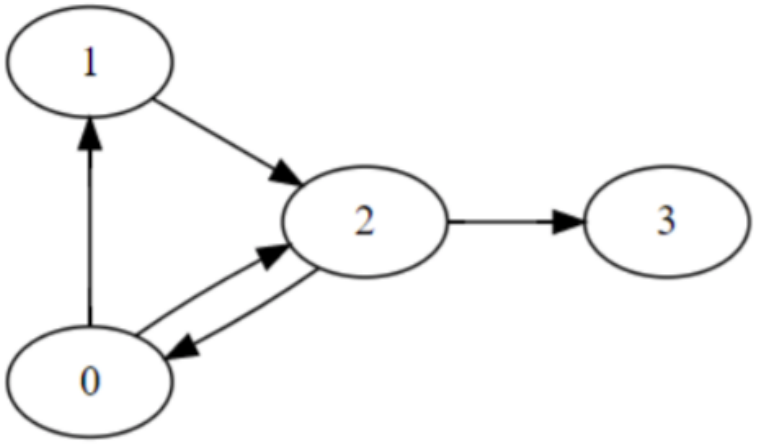
Graded Assignment 5

Q1) **Transitive closure(v)** - If there is at least one path between vertex **i** to **j** or **i == j** then **v[i][j] = 1** otherwise **0**. What is the transitive closure for the given



graph?
A1) | 1 | 1 | 1 | 1 | |—|—|—|—| | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 0 | 0 | 0 | 1 |

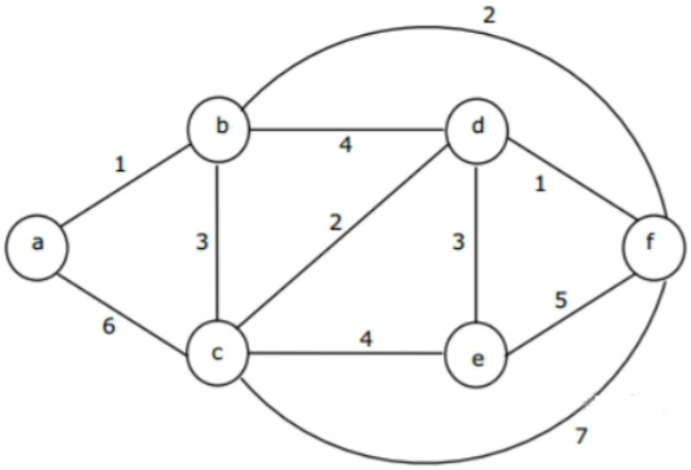
Q2) How can we use the Floyd-Warshall algorithm for all-pairs shortest paths to detect whether a graph has a negative cycle? A2) Check if any shortest path entry **A[i][i]** is negative. _____

Q3) Suppose we have a weighted undirected graph with a negative weight cycle. Which of the following is correct? A3) Both Kruskal's algorithm and Prim's algorithm can be used to compute the minimum-cost spanning tree.

Q4) We can use Breadth First Search (BFS) instead of Dijkstra's algorithm to find out the shortest path from the given source node to every other node only _____. A4) When all the edge weights are equal.

Q5) Which of the following statement is/are true? A5) - [x] Dijkstra's algorithm doesn't work for graphs with negative weights - [x] Floyd Warshall algorithm can detect negative weight cycle. - [x] Floyd Warshall algorithm works with negative weights but without negative cycle.

Q6) Suppose we run Prim's algorithm and Kruskal's algorithm on a graph G and these two algorithms produce minimum-cost spanning trees TP and TK, respectively. > (I) TP may be different from TK if some pair of edges in G have the same weight. > (II) TP is always the same as TK if all edges in G have distinct weights. Which of the following is true? A6) Both (I) and (II) are correct.



Q7) Consider the graph shown below.
Which one of the following can be the sequence of edges added, in that order, to create a minimum spanning tree using Kruskal's algorithm? A7) - [x] (a,b) (d,f) (b,f) (d,c) (d,e) - [x] (a,b) (d,f) (d,c) (b,f) (d,e) - [x] (d,f) (a,b) (d,c) (b,f) (d,e) - [x] (d,f) (a,b) (b,f) (d,c) (d,e)

Q8) Consider the given weighted adjacency matrix w for a complete undirected graph with vertex set {0, 1, 2, 3, 4} . Where w[i][j], i j in the matrix is the weight

$$w = \begin{pmatrix} 0 & 1 & 8 & 1 & 4 \\ 1 & 0 & 12 & 4 & 9 \\ 8 & 12 & 0 & 7 & 3 \\ 1 & 4 & 7 & 0 & 2 \\ 4 & 9 & 3 & 2 & 0 \end{pmatrix}$$

og the edge (i,j).
What is the weight of the minimum spanning tree for the given graph? A8) **7**

Q9) Which of the following statement(s) is/are true about the spanning tree of a connected graph? A9) - [x] A spanning tree is a connected acyclic graph. - [x] A spanning tree for an n vertex graph has exactly n-1 edges. - [x] Adding an edge to a spanning tree must create a cycle. - [x] In a spanning tree, every pair of nodes is connected by a unique path

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Q10) Consider the following weighted adjacency list **WList** for a directed and

connected graph. What will be the path weight of the shortest path from 1 to 3?

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WList = {
    #source:[(destination,weight),..]
    1:[(2,10),(8,8)],
    2:[(6,2)],
    3:[(2,1),(4,1)],
    4:[(5,3)],
    5:[(6,-1)],
    6:[(3,-2)],
    7:[(2,-4),(6,-1)],
    8:[(7,1)]
}
```

A10) **5** _____