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Assignment IV DSAL3001 Jan-Apr 2022

1. A network is represented by the following undirected, weighted graph:

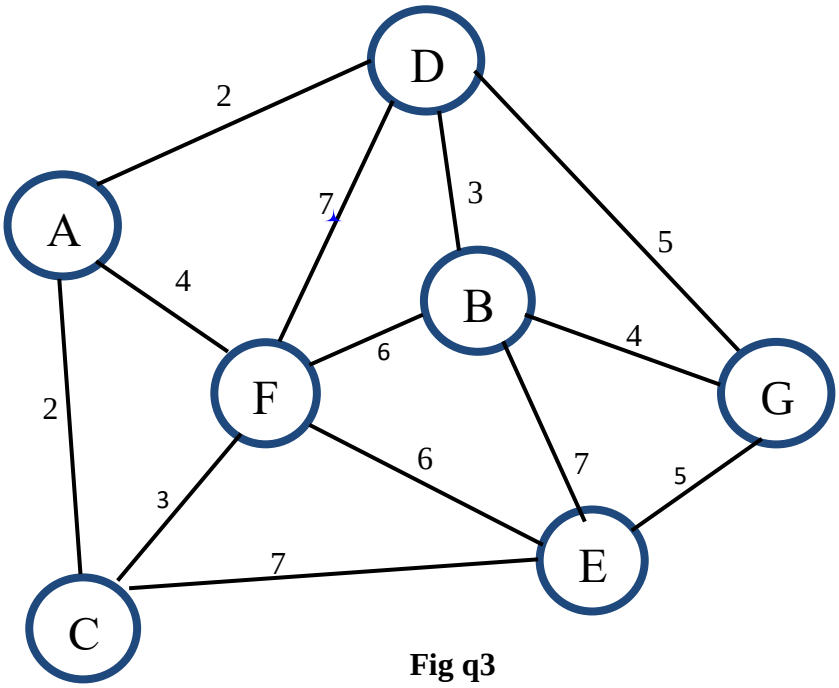

Fig q3

a. Determine the shortest path from node A to all other nodes and its length using Dijkstra's algorithm.

Clearly show all information for each node at each pass of the algorithm in Table q3.1 below and the shortest path to each Node in Table q3.2 that follows on the next page. [7 marks]

	Unvisted (Q)	Visited (S)	Current	A	B	C	D	E	F	G
	{A, B, C, D, E, F, G}	{ - }	0	0	0	0	0	0	0	0
1	{B,C,D,E,F,G}	{A}	A		(∞, B)	(2, A)	(2, A)	(∞, A)	(4, A)	(∞, A)
2	{B,D,E,F,G}	{A,C}	C		(∞, A)	(2, A)	(2, A)	(9, C)	(4, A)	(∞,C)
3	{B,E,F,G}	{A, C, D}	D		(5, D)			(9, C)		(7, D)
4	{E,F,G}	{A,C,D,B}	B		(5, D)					(7, D)
5	{E,F}	{A,C,D,B,G}	G		(5, D)			(9, C)		
6	{F}	{A,C,D,B,G,E}	E		(5, D)	(2, A)			(4, A)	(7, D)
7	{-}	{A,C,D,B,G,E,F}	F		(5, D)	(2, A)	(2, A)	(9, C)		

Table q1.1

Show the shortest path to each node in the Table 1.2 below. [3 marks]

From	To	Route	Length
A	B	A-D-B	5
A	C	A-C	2
A	D	A-D	2
A	E	A-C-E	9
A	F	A-F	4
A	G	A-D-G	7

Table q1.2

b. State the complexity of the algorithm in terms of the number of nodes and edges. Explain your answer. [3 marks]

The time complexity of the algorithm is O(ElogV) where:
V is the number of nodes
E is the maximum number of edges connected to each node.

c. Would this algorithm work if there were edges with negative weights? Explain clearly why or why not. [2 marks]

This algorithm will not work because if it have negative numbers it'll give an inaccurate result. The algorithm assumes that all edges are positive weighted. This means that the algorithm will run faster. if they are negative, it wouldn't only be inefficient but also incorrect.