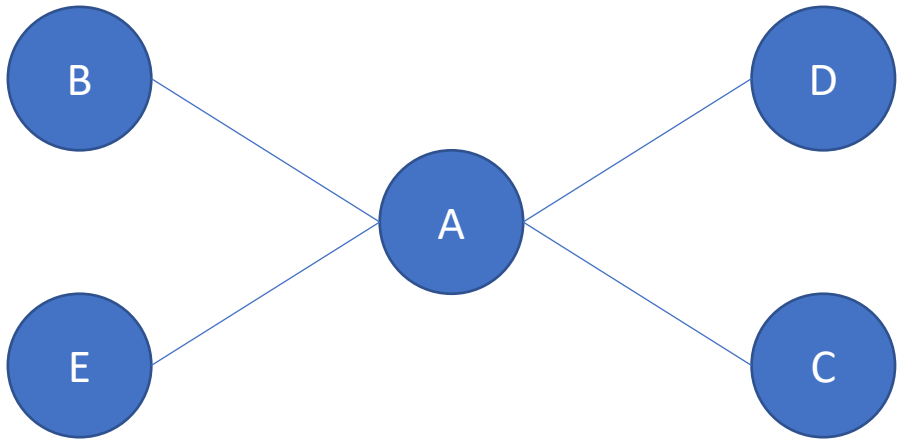
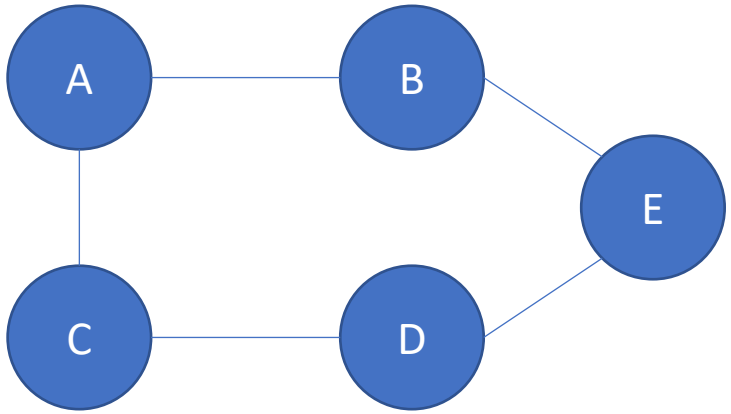


Answer 1:
Let us assume ‘A’ is the pivotal node. If that’s true, the following pairs shortest path should pass through ‘A’:

Pairs	Shortest Path
BE	BAE
BD	BAD
BC	BAC
EB	EAB
ED	EAD
EC	EAC
DB	DAB
DE	DAE
DC	DAC
CE	CAE
CD	CAD
CB	CAB

As all shortest path pass through A, we can conclude A is the pivotal for every pair of nodes.



Possible Pairs	Shortest Path	Pivotal Node
AD	ACD	C
AE	ABE	B
BC	BAC	A
BD	BED	E
CB	CAB	A
CE	CDE	D
DA	DCA	C
DB	DBE	B
EA	EBA	B
EC	EDC	D

Answer 2:
From the table we can see that every node, that is – A,B,C,D&E, serve as a pivotal for at least one pair of nodes.

Answer 3:

a. Node ‘B’ and Node ‘C’ are gatekeepers in figure 1.
b. Node ‘B’ serves as the connection between the three graphs ‘BAE’, ‘BCGF’ and ‘BCD’ (It can be divided/written in other ways as well). If we remove Node ‘B’, these three sub graphs will disconnect. Node ‘C’ serves as the connection between Node ‘D’ and all the other nodes in the graph. If we remove Node ‘C’, Node ‘D’ will completely disconnect from the graph.

Answer 4:

Nodes	Neighboring Nodes	Are nodes connected directly?	Is local gatekeeper?
A	B,E	Yes	No
B	A,C,E,F	No	Yes
C	B,D,G	No	Yes
D	C	No node to connect	No
E	A,B	Yes	No
F	B,G	No	Yes
G	F,C	No	Yes

a. ‘A’,’ D’&’E’
b. Looking at the table, we can conclude that Node ‘A’,’ D’&’E’ are NOT local gatekeepers.

Answer 5:

a. Node B and Node C
b. Node B & C are also the gatekeeper for the graph. If we break the graph into two parts, ‘ABE’ and all the other nodes, all path from one sub graph to another will pass through Node ‘B’ making it the pivotal node for these pairs. With the same logic, Node ‘C’ connects Node ‘D’ to all the other nodes, and the shortest path for every pair involving Node ‘D’ will pass through Node ‘C’. Thus Node ‘B’ and Node ‘C’ are pivotal nodes.

Answer 6

The Darpanet (I thought it was ARPANET?) was designed in a way that if one of the nodes failed, it should not affect the other nodes. It was a network graph, so the idea was all nodes (research schools here) should relate to multiple routes as a safeguard to failing nodes.

If we had a gatekeeper here, and that gatekeeper node failed, the entire network would have been disrupted to the parts it connects.

Answer 7:

a. UCSB and STAN
b. UCSB and STAN are not pivotal nodes as their edge nodes are also directly connected with each other and thus they do not serve as the shortest path where the path must pass through them.

Answer 8:

Triadic Closure states that my two best friends who do not know each other may most likely become best friends at some point in the future.

Now in proper terms, if two nodes in a social network have a common connection, they will most likely connect sometime in the future.

For example, if ‘A’ knows ‘B’ and ‘C’ – there is a chance that ‘B’ and ‘C’ might connect in the future and a direct connection be formed.

Answer 9:

a. The edge should be labeled ‘W’.
b. If we label that edge as strong, ‘B’ and ‘C’ have the other two nodes also as strong and then according to triadic closure they should be connected as well.

Answer 10:

a. BC and CE
b. BC and CE have strong ties, which will eventually lead to BE forming a connection. Now with BE in place, BE and BA have strong ties, which will lead to AE to form a connection. Therefore, BE and AE will form links.

Answer 11 (a):

If I (‘A’) have a strong network of two friends, say ‘B’ and ‘C’, we already know everything about each other, and I can’t expect any new information to float occasionally.

Now my friend might have another weak connection with a new person he met, let's call them ‘D’, this person will bring new information to the table which can include helpful data about job search as well.

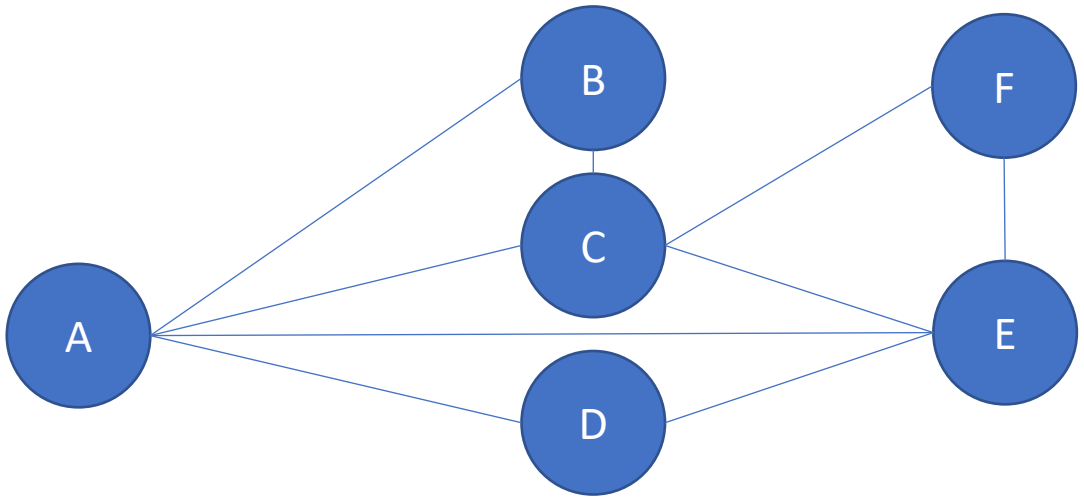
Now person ‘D’ has to be a weak connection of my friend, which results in a bridge forming. If this guy was a strong connection, there are very high chances I already knew him and everything about him as we both share common strong connection.

Answer 11 (b):

I always knew this is how it was happening in terms of job search, but this is the fist time I am studying about it and the well explained logic behind it. I have observed this pattern in my own job hunts as well.

Mostly in terms of finding referrals for jobs.

Answer 12:



A,C,&E have four edges each, which is different from all other nodes. Each one of them serve a link as an edge in other triangles formed.

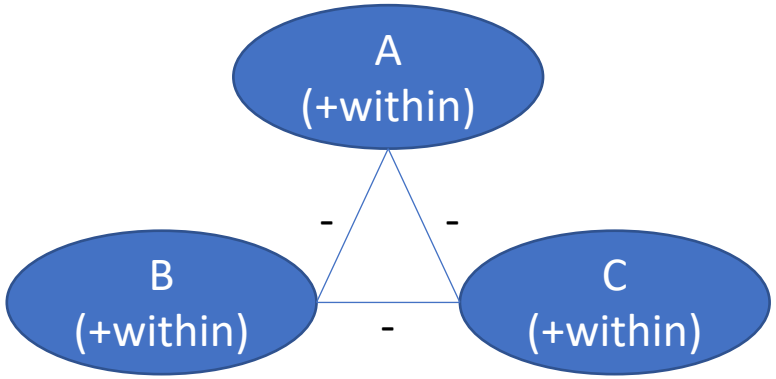
Answer 13:

a. 3-node cliques:
   - AXB – Unbalanced
   - AXC – Unbalanced
   - BXC – Balanced
   - ABC – Balanced

b. Unbalance

c. The complete graph is balanced if every one of its triangles is balanced. In this case not all triangles are balanced and thus the graph is not balanced.

Answer 14:



- Let the villages be A,B and C
- As everyone knows everyone within the village and are friends with them, it is a balanced graph for individual village

a. It is unbalanced
b. As all edges carry a negative weight
c. Yes
d. As all sets of people are enemies with each other
e. Yes
f. When we are comparing only two villages, the complete graph of people is being divided into two sets of mutual friends, with complete mutual antagonism between two groups, and thus it is balanced.