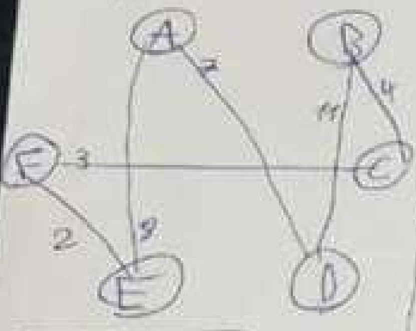
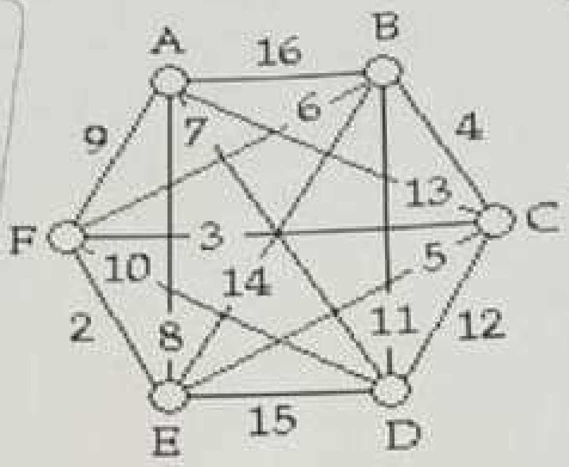
Use the following to answer questions (1 - 4)

Consider the following symmetric, undirected network G where the numbers next to each arc are the arc costs. Suppose that your goal is to find a good traveling salesman tour that visits all of the nodes of G.

Q2 Tour



$\boxed{\text{cost} = 35}$



Q1 MST

c(MST) = 24

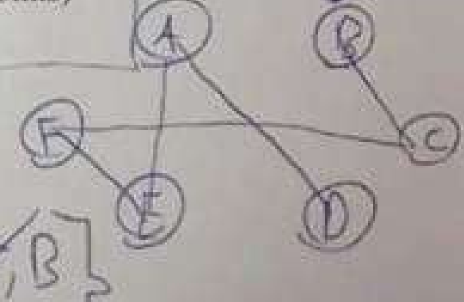
1. Complete the following table that shows the lower bounds using several techniques: (2.5 points)·

technique	Lower bound
MST+arc	24+5 = 29
$1-TREE_A$	19 + (7+8) = 34
$1-TREE_B$	(2+3+7+8) + (4+6) = 30
$1-TREE_C$	(2+6+7+8) + (3+4) = 30
$1-TREE_D$	(2+3+4+8) + (7+10) = 34

17 + 17

2. Suppose the Nearest Neighbor heuristic is used to build a TSP tour starting at vertex A yields the Tour------------------------ , cost is ~~35~~-- (2 points)

3. Twice around $\boxed{\text{MST}}$



walk = { B, C, F, E, A, D, ~~A~~, ~~E~~, ~~F~~, ~~C~~, B }

$\boxed{c(\text{walk}) = 35}$

$\frac{5(4)}{2}$

stion 1: (7 points)

Number of possible tours in the undirected complete graph G with 5 vertices is :

a) 60
b) 30
c) 24
d) 12
e) 6

Christofides' heuristic is an effective practical heuristic that has the best-known worst-case performance bound for the traveling salesman problem on complete networks satisfying the triangle-inequality

a) True
b) False

For complete graphs with positive arcs, always the cost of the optimal MST is less than or equal to the cost of optimal TSP

a) True
b) False

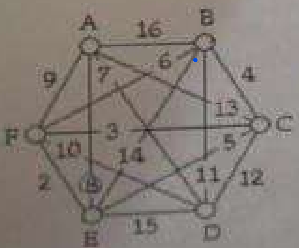
4. Christofides heuristic will produce a walk with the same total cost regardless of which is node is selected in the initialization.

a) True
b) False

5. Given a set of nodes N and a set of arcs representing a spanning tree T, the number of nodes with odd degree with respect to the arc set T is even.

a) True
b) False

6. A delivery truck must deliver packages to 6 different store locations (A, B, C, D, E, and F). The trip must start and end at A. The graph below shows the distances (in miles) between locations. We want to minimize the total distance traveled.



(F,E) → (F,E) | (A,D) → (A,D)
(F,C) → (E,C) | (A,E) → (E,D)
(C,B) → (E,B) | (E,F) → (F,D)
(E,A) → (A,B) | (E,B) → (D,B)
(A,B) | (C,B) → (D,C)

The nearest-neighbor algorithm starting at vertex A yields the Tour T{A,D,C,B,F,E,A} cost is 31

(A,B,C,F,E,A)