University of Colombo School of Computing
SCS 1304 - Problem Solving Strategies and Computation Approaches

Lab Sheet 11

1. Define the terms tree, spanning tree, minimum spanning tree and state one difference between Kruskal's algorithm and Prim's algorithm, to find a minimum spanning tree.
2. Use Kruskal's algorithm to find the minimum spanning tree for the network shown in Fig. 1. State the order in which you included the arcs. Draw the minimum spanning tree in Diagram 1 below and state its length.

Figure 1

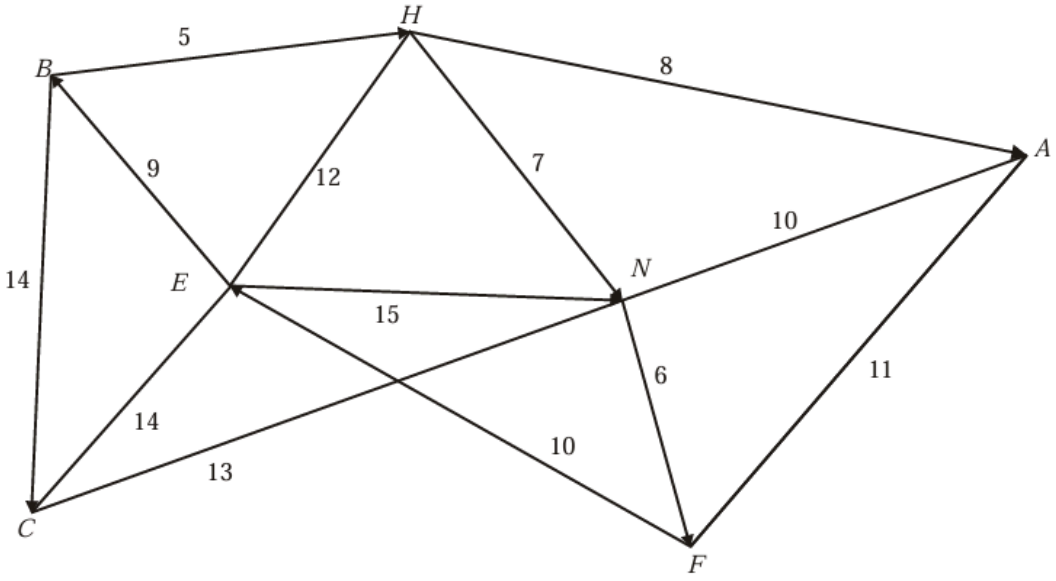
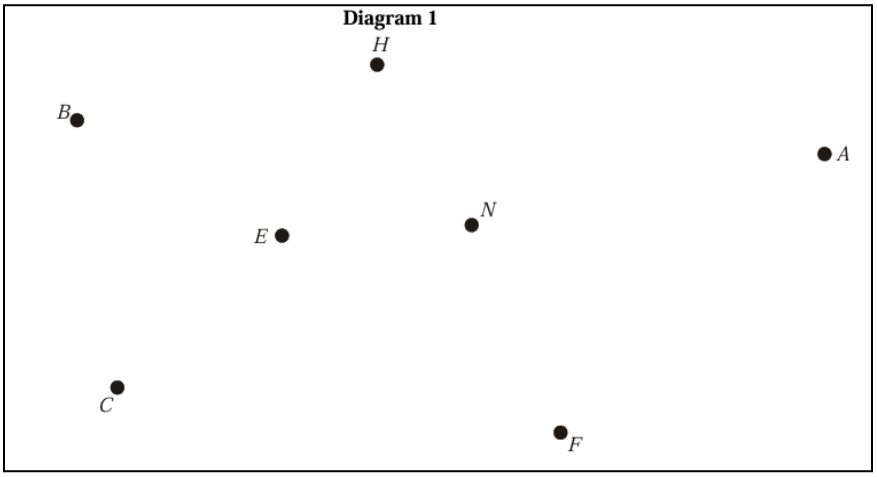


Diagram 1



3. Figure 2 models a car park. Currently there are two pay-stations, one at E and one at N. These two are linked by a cable as shown. New pay-stations are to be installed at B, H, A, F and C. The number on each arc represents the distance between the pay-stations in metres. All of the pay-stations need to be connected by cables, either directly or indirectly. The current cable between E and N must be included in the final network. The minimum amount of new cable is to be used.

Figure 2

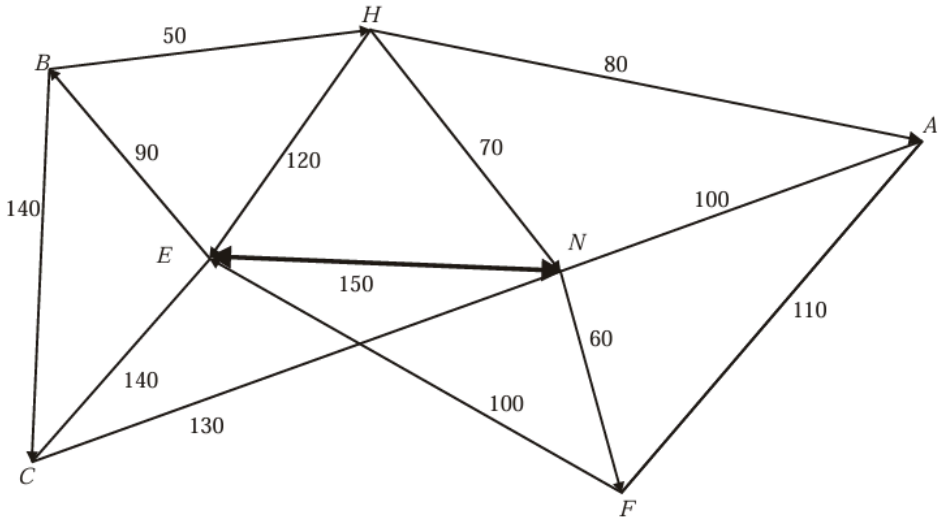
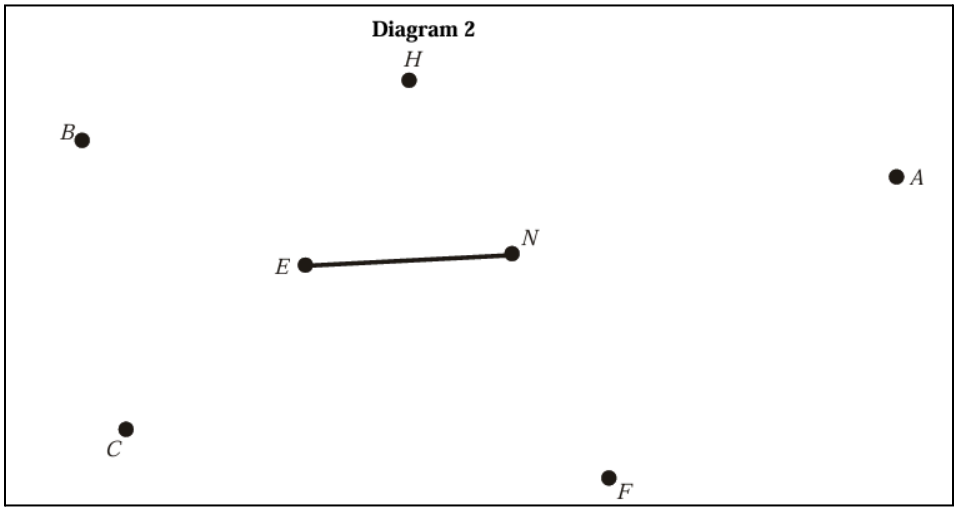


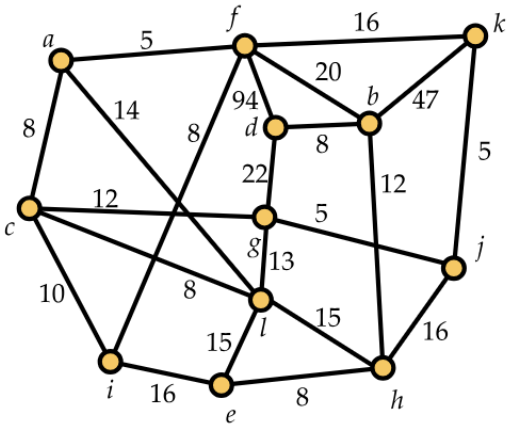
Diagram 2



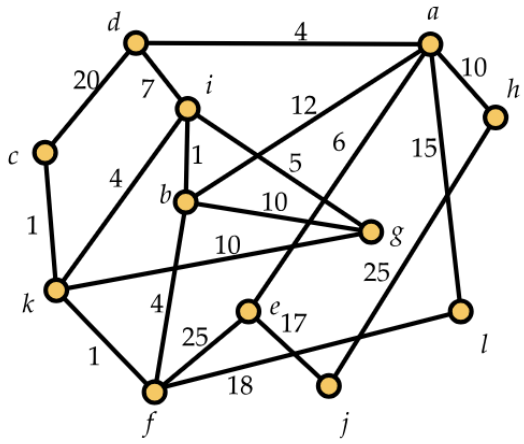
Using your answer to question 02, or otherwise, determine the minimum amount of new cable needed. Use Diagram 2 to show where these cables should be installed. State the minimum amount of new cable needed.

4. For the given graphs A and B, use Kruskal's algorithm ("avoid cycles") to find a minimum weight spanning tree. Your answer should include a complete list of the edges, indicating which edges you take for your tree and which (if any) you reject in the course of running the algorithm.

5. For the given graphs A and B, use Prim's algorithm ("build tree") to find a minimum weight spanning tree. Your answer should list the edges selected by the algorithm in the order they were selected.

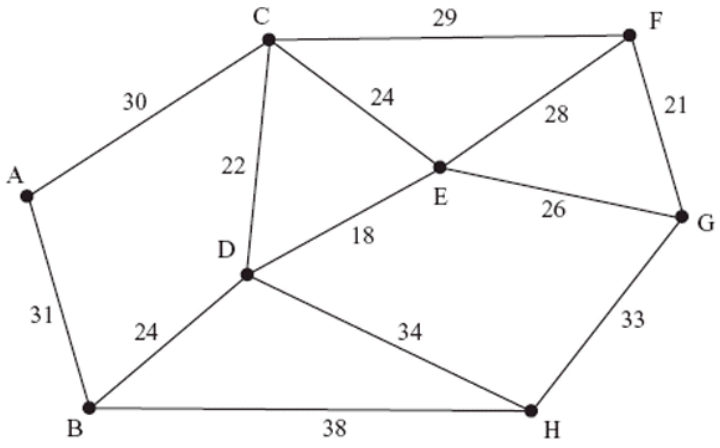


Graph A



Graph B

6. The diagram below represents the distances, in metres, between eight vertices, A, B, C, D, E, F, G and H, in a network.



A. Use Kruskal's algorithm to find a minimum spanning tree for the network. You should list the arcs in the order in which you consider them. In each case, state whether you are adding the arc to your minimum spanning tree.

B. Complete the matrix below, to represent the network.

	A	B	C	D	E	F	G	H
A	–	31	30	–	–	–	–	–
B	31	–	–		–	–	–	38
C	30	–	–		24		–	–
D	–			–	18	–	–	
E	–	–	24	18	–	28		–
F	–	–		–	28	–	21	–
G	–	–	–	–		21	–	
H	–	38	–		–	–		–

C. Starting at A, use Prim's algorithm to determine a minimum spanning tree. You must clearly state the order in which you considered the vertices and the order in which you included the arcs.

D. State the weight of the minimum spanning tree.