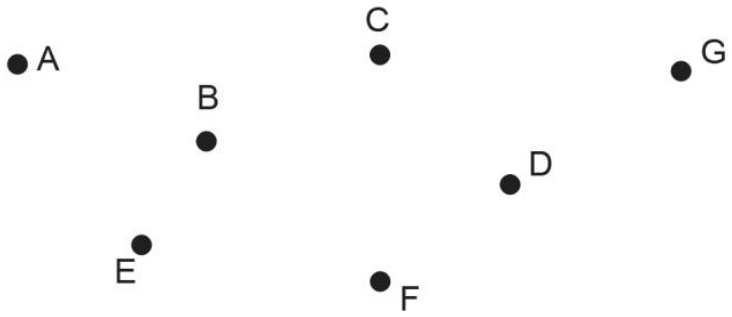
Question 15 **(7 marks)**

A number of streets connecting locations A to G inclusive have been identified as needing lighting upgrades with energy-efficient LED lamps. The council has decided that each location must have at least one connecting street that receives the lighting upgrade. The table below shows the cost, in dollars, of completing the upgrade in each street.

	A	B	C	D	E	F	G
A	–	7900	10 300	–	7100	–	–
B	7900	–	7600	6200	6500	–	15 400
C	10 300	7600	–	8500	–	12 200	9200
D	–	6200	8500	–	8000	4700	9800
E	7100	6500	–	8000	–	4800	–
F	–	–	12 200	4700	4800	–	10 100
G	–	15 400	9200	9800	–	10 100	–

The council has a limited budget, so it needs to complete the upgrades at minimum cost.

(a) Demonstrate the use of Prim's algorithm on the table above to determine the minimum spanning tree and draw it on the diagram below. (3 marks)



(b) The council has set aside $42 000 to complete the lighting upgrades. Does it have enough in its budget to make the necessary upgrades? Justify your answer. (2 marks)

(c) Due to the location of the police station, the upgrade from D to C must be included. What effect will this have on the minimum cost and the spanning tree? (2 marks)