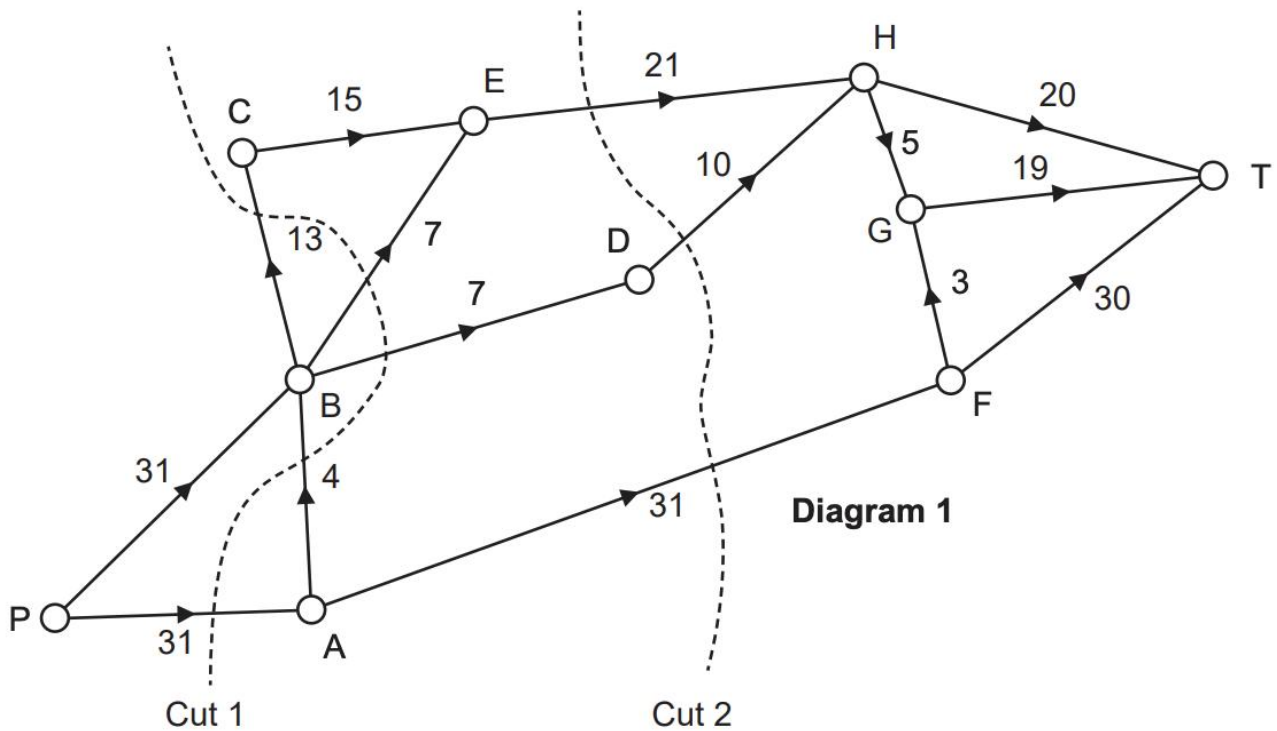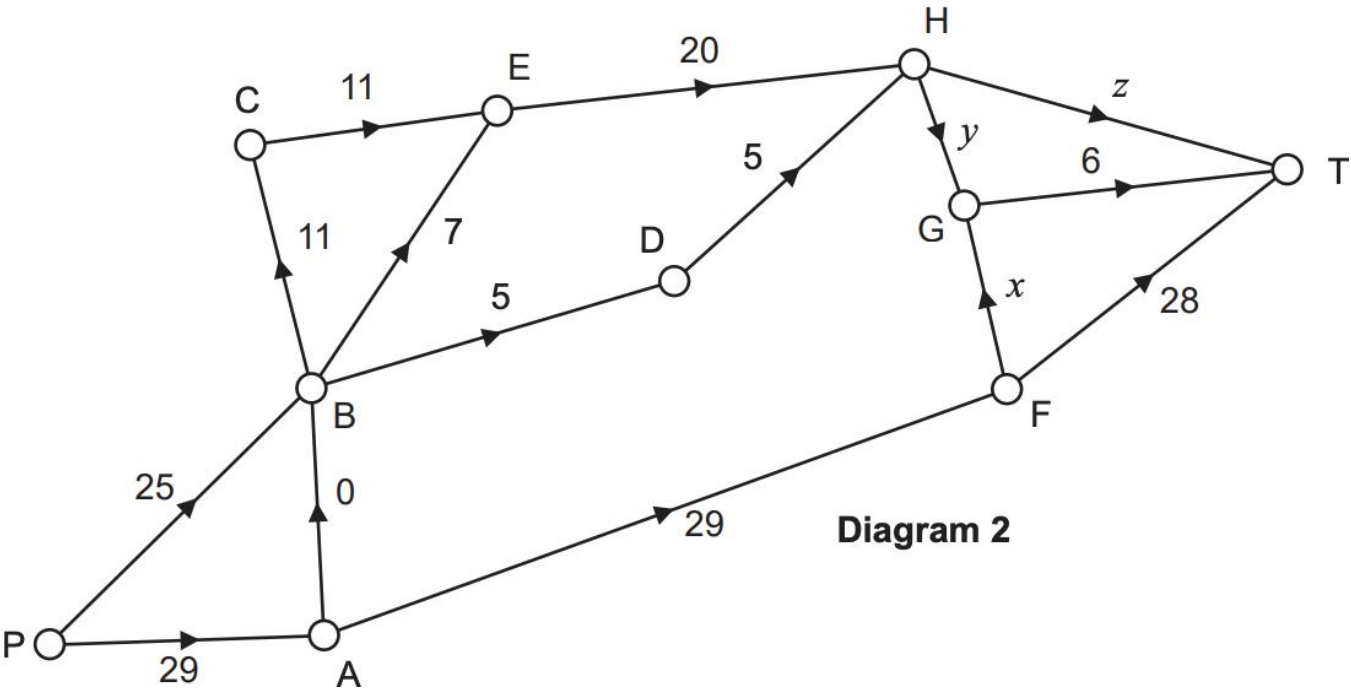**Question 15** (11 marks)

The directed network below shows the maximum available capacity for transferring power between different sub-stations on a small island. The number on each edge gives the capacity in kilovolts (kV).

Diagram 1

(a) State the capacity of each cut in Diagram 1. (2 marks)

Diagram 2 shows a possible flow through the same network.

Diagram 2

(b)   Determine the initial flow in Diagram 2.   (1 mark)

(c)   Calculate the value of x, y and z in Diagram 2.   (3 marks)

(d)   Determine the maximum flow for the original network (Diagram 1).   (2 marks)

Engineers wish to increase the maximum capacity to sub-station T. They propose to add a new transmission line from E to T of capacity 3 kV **or** a new transmission line from D to G of capacity 3 kV.

(e)   Determine which of these proposals will increase the maximum capacity to sub-station T. Justify your answer.   (3 marks)