4 A transmission line is used to deliver power in a high voltage a.c. transmission system.

Fig. 4.1 shows the variation with time t of the voltage V across the transmission line.

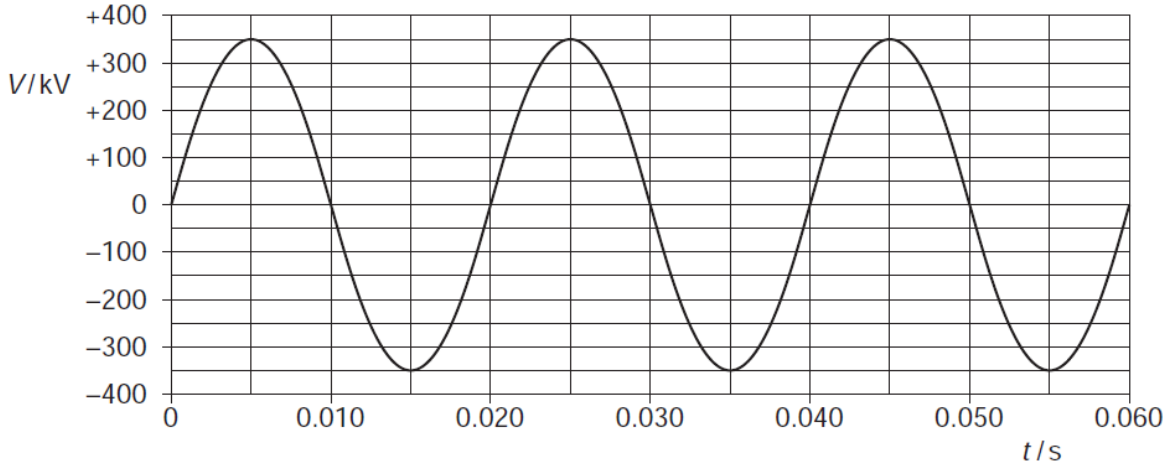

Fig. 4.1

Fig. 4.2 shows the variation with time t of the current I in the transmission line.

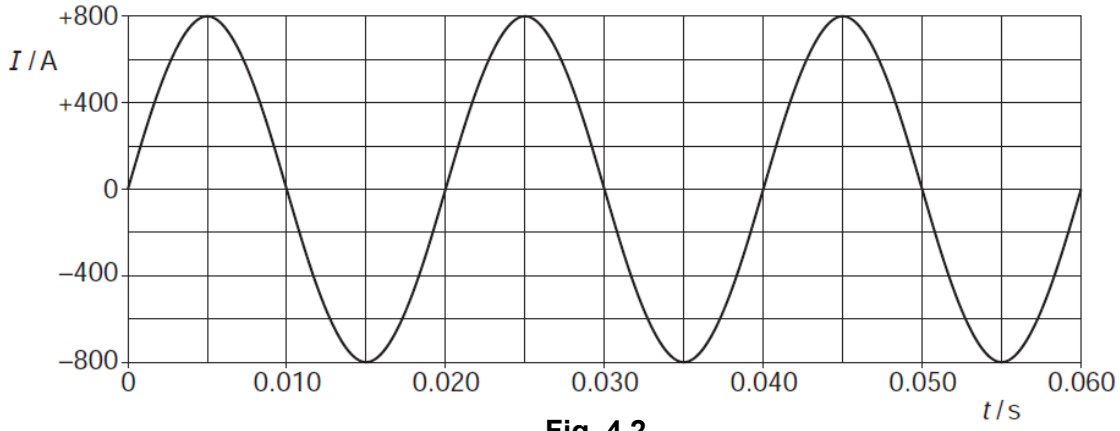

Fig. 4.2

(a) Determine the power delivered by the transmission line at

(i) t = 0.015 s,

power = ... W [1]

(ii) t = 0.030 s.

power = ... W [1]

(b) Using information from Fig. 4.1 and Fig. 4.2, sketch a graph on the axes of Fig. 4.3 to show the variation with time *t* of the power *P* delivered by the transmission line. Indicate the value of the maximum power on Fig. 4.3.

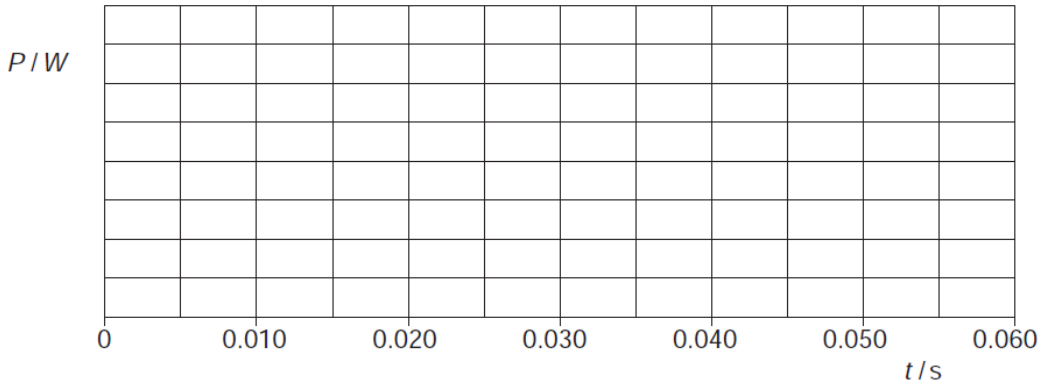

Fig. 4.3 [2]

(c) It is suggested that this transmission line is also used in a high voltage direct current (HVDC) transmission system delivering a current of 800 A at a constant voltage of 350 kV.

Show, with some workings, that the average power delivered by the HVDC transmission line would be greater than that delivered by the line when transmitting the a.c..

.....

..... [2]

(d) The a.c. transmission line passes through an ideal transformer of step-down ratio 20:1.
Explain the change, if any, to the peak value of the current of the a.c..
You may show your workings in the spaces below.

.....

..... [2]

[Total: 8]