5

(a)

Two resistors and two ideal diodes are connected to an AC supply as shown in Fig. 5.1. Ideal diodes have zero resistance when forward-biased and infinite resistance when reverse-biased.

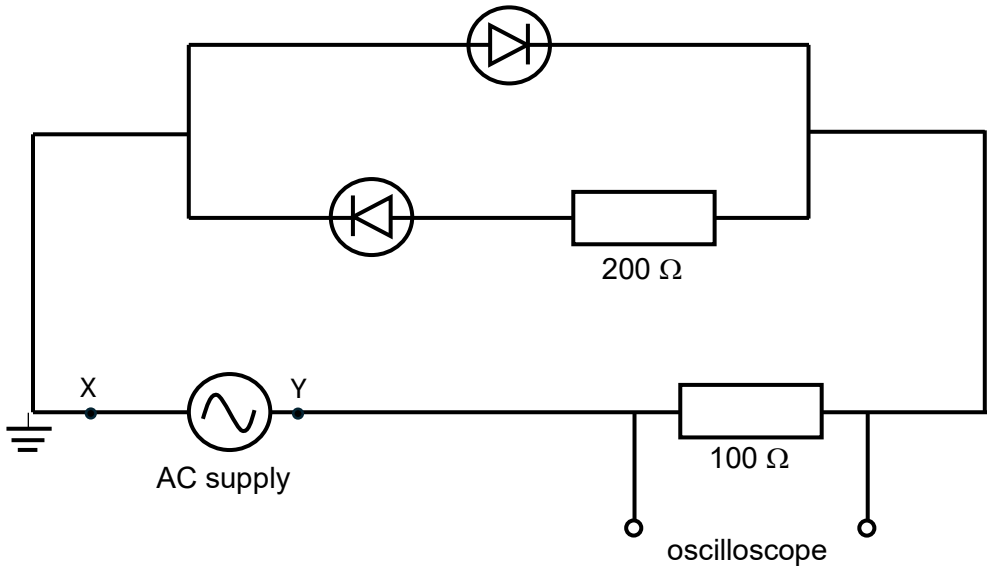


Fig. 5.1

Fig. 5.2 shows the variation with time of the potential of the AC supply at point Y.

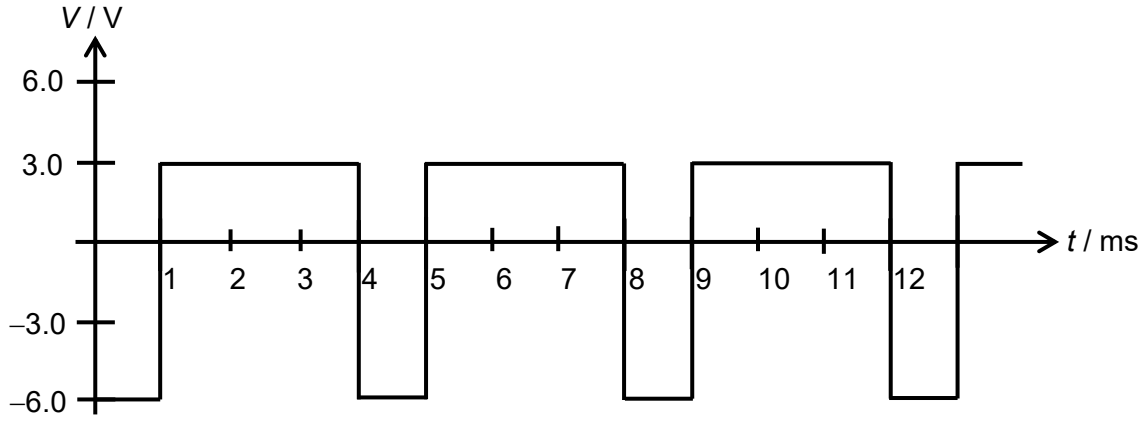


Fig. 5.2

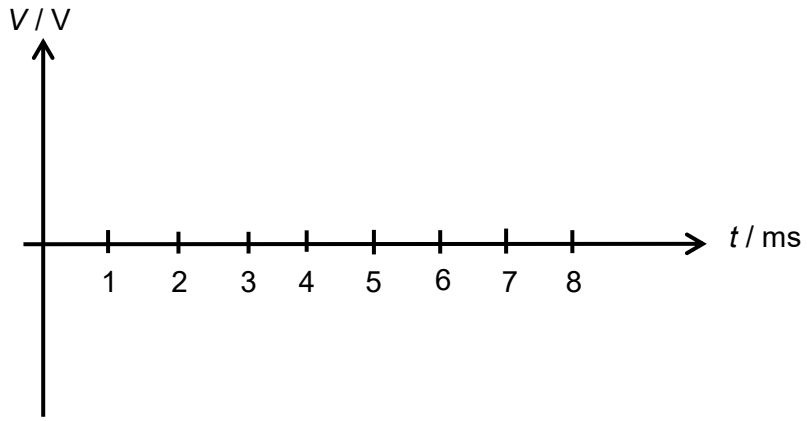
(i)

Determine the root-mean-square voltage of the AC supply.

root-mean-square voltage = ... V [2]

(ii)

Sketch the variation with time of the voltage across the 100 Ω resistor for the first 8 seconds using the axes below.



[2]

(b)

A transmission line that has a resistance per unit length of $4.50 \times 10^{-4}\ \Omega m^{-1}$ is to be used to transmit 5.00MW over 6.44×10^{5} m. The output voltage of the generator is 4.50 kV.

(i)

A transformer is used to step up the voltage to 500 kV before transmission of power. Determine the turns ratio of the transformer.

turns ratio = ... [1]

(ii)

Determine the power loss during transmission.

power loss = ... W [3]

(iii)

Explain the advantage to step up the voltage before transmission of power.

……

…….…… [1]

[Total: 9]