5 **(a)** Explain what is meant by r.m.s. value of an alternating voltage in terms of energy dissipation.

……

……

…… [2]

(b) A voltage supply V_s has the voltage output waveform as shown in Fig. 5.1.
The curved portion of the voltage follows a sinusoidal shape.

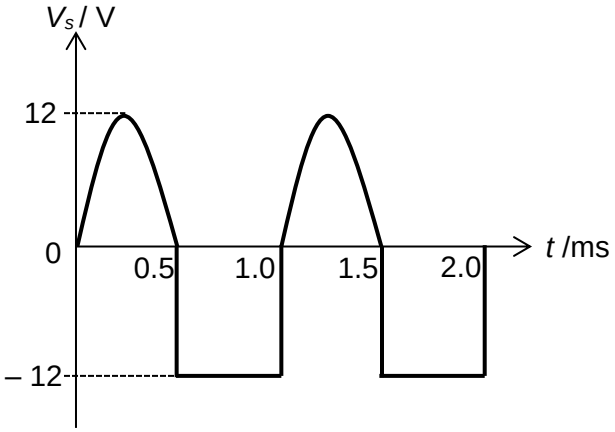

Fig. 5.1

(i) Calculate the root-mean-square voltage of this supply.

root-mean-square voltage = ...V [3]

(ii) The voltage supply is then connected to a circuit as shown in Fig. 5.2. Each of the three resistors has a resistance of 10 Ω. The two diodes can be taken to be ideal. The value of the voltage shown in Fig. 5.1 is taken to be positive when terminal X is at higher potential.

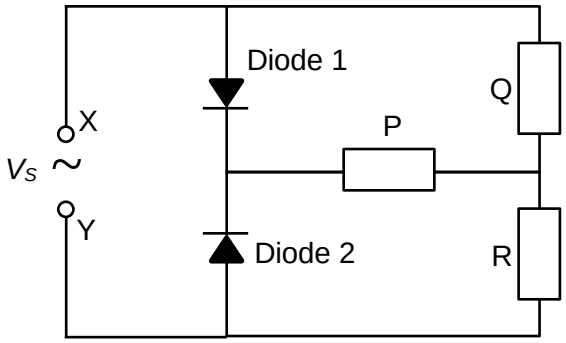

Fig. 5.2

In Fig. 5.3, state whether each diode is forward-biased or reversed-biased when terminal X of the voltage supply is at a higher potential.

Diode 1	
Diode 2	

Fig. 5.3

[1]

(iii) Calculate the maximum potential difference across resistor P when terminal X of the supply is at higher potential.

potential difference = ... V [2]

(iv) Hence, sketch on Fig. 5.4 below, how the potential difference, V_P, across resistor P varies with time from $t = 0$ until $t = 2.0$ ms. Exact numerical values are not required.

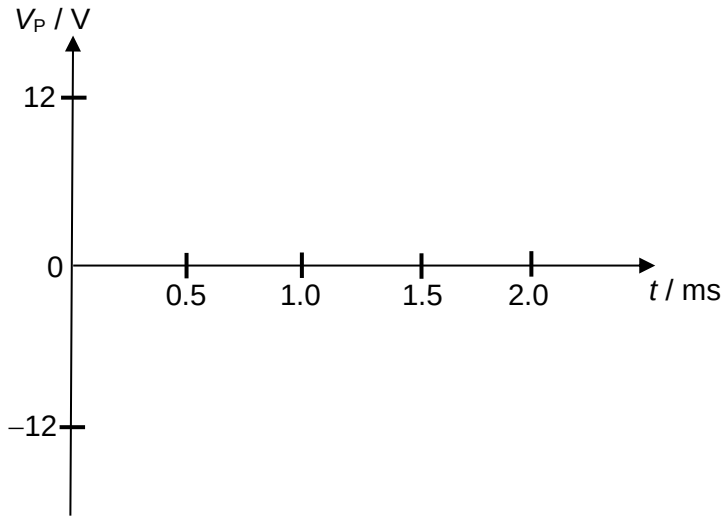

Fig. 5.4

[2]

[Total : 10]