# Basic Electronic Circuits

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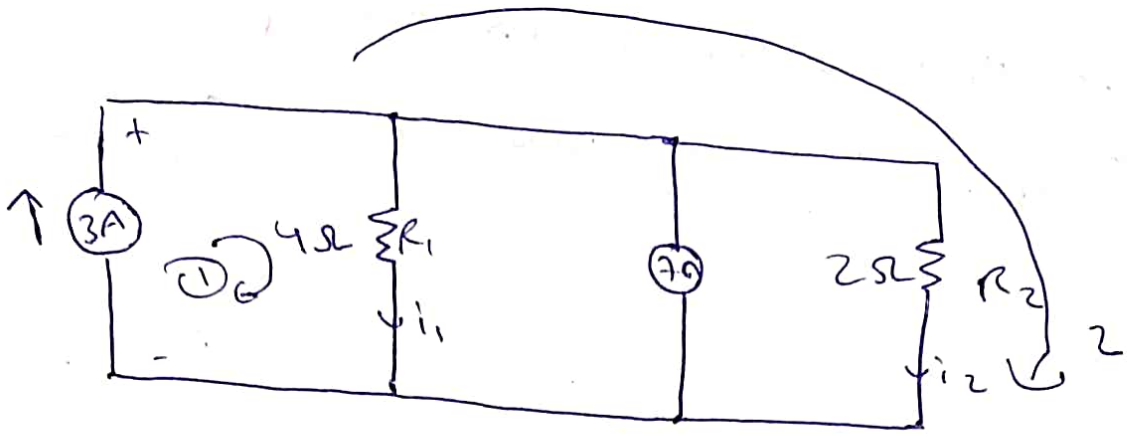
Q-1




(a) Taking the loop 2

$$V = i_2 \times R_2 = 2i_2 \quad -(1)$$

Taking loop 1

$$V = i_1 R_1 = 4i_1 \quad -(2)$$

Equating (1) & (2)

$$2i_1 = i_2$$

from figure

$$i_2 + 7A = i_3 \quad -(3)$$

$$-(4)$$

$$i_1 + i_3 = 3A$$

from (1), (2), (3), (4)

$$i_1 = -\frac{4}{3}$$

$$i_2 = -\frac{8}{3}$$

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(b) The three water heaters are parallel

hence equivalent resistance $= \frac{5}{3}\ \Omega$

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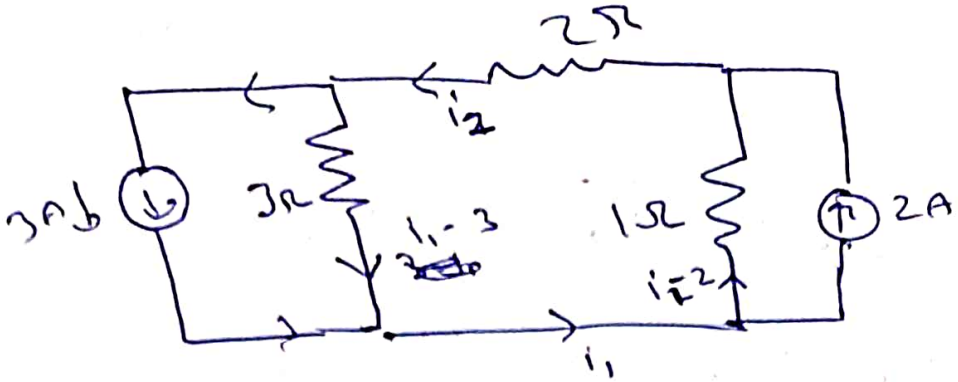
Q-2




Applying KVL

$$-(i_1-3)3 = (i_1-2)1 + 2i_1$$

$$-3i_1 + 9 = 3i_1 - 2$$

$$6i_1 = 11$$

$$i_1 = 11/6$$

Power absorbed by $3\Omega = \left(\frac{11}{6} - 3\right)^2 \times 3$

$$= \left(\frac{7}{6}\right)^2 \times 3 = \frac{49}{12}\,W$$

Power absorbed by $1\Omega = \left(\frac{11}{6} - 2\right)^2 \times 1$

$$= \left(\frac{1}{6}\right)^2 \times 1$$

$$= \frac{1}{36}\,W$$

Power absorbed by $2\Omega$

$$= \left(\frac{11}{6}\right)^2 \times 2$$

$$= \frac{121}{18}\,W$$

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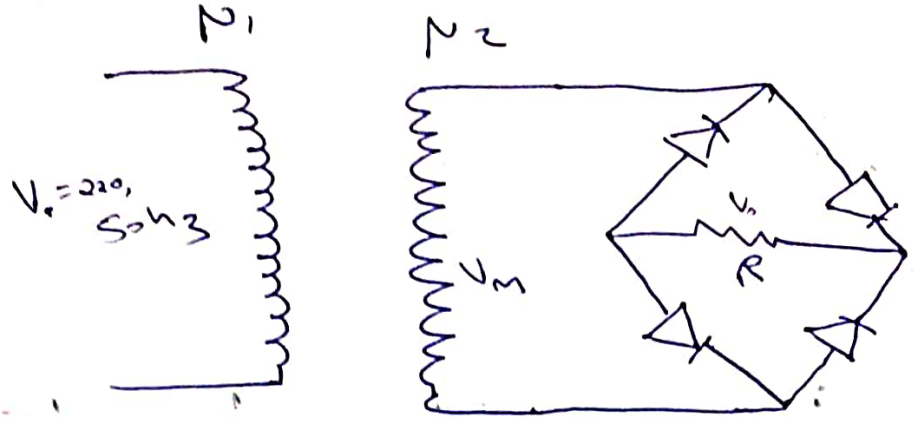
Q-3




$$\frac{V_1}{V_2} = \frac{N_1}{N_2}$$

$$\frac{220}{V_2} = \frac{N_1}{N_2}, \quad V_2 = V_{rms} = 22V \quad V_m = 22\sqrt{2}$$

~~$V_{rms} = \frac{22}{\sqrt{2}} V = 11\sqrt{2}$~~

$$V_{avg} = \frac{22\sqrt{2} \times 2}{\pi} = \frac{44\sqrt{2}}{\pi}$$

Applying KVL we get,

~~$V_{rms}$~~ $- 0.7 - 0.7 - 2.2K(i_{rms}) = 0$

$1.4 - 2.2K(i_{rms})$

$$i_{rms} = \frac{22}{2.2} - \frac{1.4}{2.2} \text{ mA}$$

$i_{rms} =$

$$V_{avg} - 0.7 - 0.7 - 2.2K(i_{avg}) = 0$$

$$\frac{44\sqrt{2}}{\pi} - 1.4 - 2.2K(i_{avg}) = 0$$

$i_{avg}$ ~~$i_{rms}$~~ $= 8.37$ mA

Time period $= 10^{-2}$ sec

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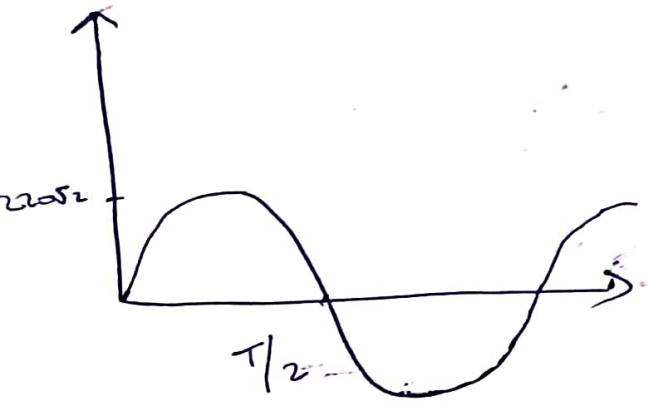
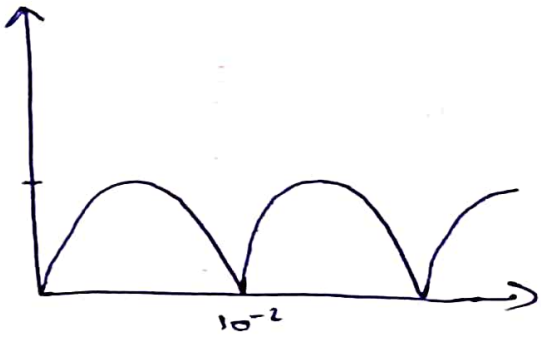
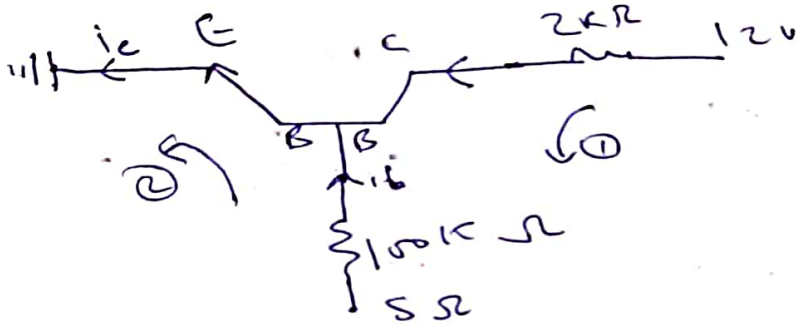



Q-4




Applying loop ①

$$12 - (2k)i_c + (100K)i_b - V_{CB} = 5$$

Applying loop ②

$$5 - (100K\Omega)i_b - V_{BE} = 0$$

$$i_b = \frac{4.3}{100K}$$

$$\therefore i_b = 0.043\,mA$$

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$\beta = \frac{i_c}{i_b}$

$100\, i_b = i_c$

$10 - 2K(100) i_b + 100K\, i_b = V_{CB}$

$10 - 100K\, i_b = V_{CB}$

$V_{CB} = 10 - 4.3$

$= 5.7V$

$V_{CC} = V_{CB} + V_{BE}$

$= 5.7 + 0.7$

$= 6.4\ V$

$i_c = i_b \beta$

$I_C = 4.3\ mA$