Current & Resistance

Question 01

$J = 440\ A/cm^2$

$d = ?$

$I = 0.552\ A$

$$J = \frac{I}{A} = \frac{I}{\pi r^2}$$

$$440 = \frac{0.552}{\pi r^2}$$

$$r = \sqrt{\frac{0.552}{440 \times \pi}}$$

$$r = 0.0199\ cm$$

$$\boxed{r = 0.0399\ cm}$$

Scanned with CamScanner

nqADx

Question 02

$I = 115A$

$A = 31.2\ mm^2 = \frac{31.2}{1000 \times 1000} = 3.12 \times 10^{-5}\ m^2$

$Dx = l = 85.5\ cm = 0.855\ m$

$n = 8.49 \times 10^{28}\ m^3$

$\Delta t = ?$

$I = nqAV_d$

$I = \frac{nqA\Delta x}{\Delta t}$

$\Delta t = \frac{nqA\Delta x}{I}$

$= \frac{8.49 \times 10^{+28} \times (1.6 \times 10^{-19}) \times 3.12 \times 10^{-5} \times 0.855}{115}$

$\Delta t = 3151.015 s$

Scanned with CamScanner

Practice Question

$I = 300A$

$A = 0.21 cm^2 = 0.21 \times 10^{-4} m^2$

$\Delta x = l = 0.85m$

$n = 8.49 \times 10^{28} m^{-3}$

$$\Delta t = \frac{nq A \Delta x}{I}$$

$$= \frac{8.49 \times 10^{28} \times 1.6 \times 10^{-19} \times 0.85 \times 0.21 \times 10^{-4}}{300}$$

$$\boxed{\Delta t = 807.296s}$$

OR

$\Delta t = 13 min\ 27 secs$

Scanned with CamScanner

Question 03

$\rho = 9.4\ \Omega m$

$C = 110\ pF = 110 \times 10^{-12}\ F$

$R = ?$

$\epsilon_0 = 8.85 \times 10^{-12}\ F/m$

Sol

Since,

$$C = \frac{\epsilon_0 A}{d}$$

$$\frac{A}{d} = \frac{C}{\epsilon_0} = \frac{110 \times 10^{-12}}{8.85 \times 10^{-12}}$$

$$\boxed{\frac{A}{d} = 12.49\ m}$$

$\because R = \rho \frac{l}{A}$ $\quad \because \frac{A}{d} = 12.49\ m$

$R = 9.4 \times \left(\frac{1}{12.49}\right)$ $\quad \frac{d}{A} = \frac{1}{12.49}$

$$\boxed{R = 0.752\ \Omega}$$

Scanned with CamScanner

Question 04:

$V = 3.5I^2$ V

a) R when $I = 2.4$mA

b) I when $R = 16\Omega$

Sol

a) R when $I = 2.4mA = 2.4 \times 10^{-3}$ A

$V = 3.55(2.4 \times 10^{-3})^2$

$V = 2.0448 \times 10^{-5}$ V

$R = \frac{V}{I} = \frac{2.0448 \times 10^{-5}}{2.4 \times 10^{-3}}$

$R = 8.52 \times 10^{-3}\Omega$

b) I when $R = 16\Omega$

$V = 3.55I^2$

$R = 3.55I^2$

$I = \frac{16}{3.55} = 4.507$ A

Scanned with CamScanner

Question 05:-

$V = 9V$

$P = 7.5W$

$t = 6hr = 6 \times 3600 = 21600s$

Sol

$P = VI$

$I = P/V = 7.5/9 = 0.833A$

$I = q/t$

$q = 0.833 \times 21600$

$q = 17992.8C$

Ans

Scanned with CamScanner