Method - II

# R.M.S / Effective Value

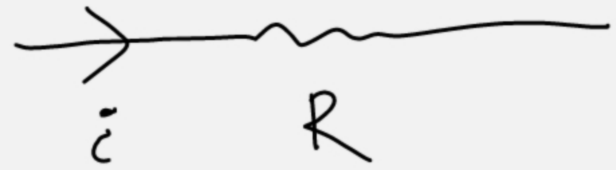
$$I^2R = \frac{I_m^2 R}{2}$$

$$I_{eff/r.m.s} = I = \frac{I_m}{\sqrt{2}}$$


$$E_{dc} = I^2Rt$$

$$P_{d.c} = I^2R$$

$$P_{avg(d.c)} = I^2R$$




$$E_{ac} = i^2Rt$$

$$P_{a.c} = i^2R = \frac{(I_m \sin\omega t)^2}{R}$$

$$= I_m^2R\left[\frac{1-\cos 2\omega t}{2}\right]$$

$$= \frac{I_m^2R}{2} - \frac{I_m^2R}{2}\cos 2\omega t$$

$$P_{avg(a.c)} = \frac{I_m^2R}{2}$$

Q.1. An alternating current is given by

$$i = 141.4 \sin 314t$$

find (i) max value (ii) freq (iii) time period.

(iv) $i$ ] at 3 ms.

(v) $\frac{di}{dt}$ ] at 3 ms

Sol^ :-

(i) $i_{max} / i_m = 141.4\,A.$

(ii) $f_{req} = f = \frac{314}{2\pi} = 50\,Hz$

(iii) Time period $(T) = \frac{1}{f} = 20\,ms.$

(iv) $= 141.4 \sin\left(\frac{314 \times 3}{1000}\right)$

$= 114.35\,A$

$96 = 120 \sin 120\pi t$

$t = \frac{1}{120\pi} \sin^{-1}\left(\frac{96}{120}\right)$

2. An a.c of frequency (50 Hz) has max value (120A).

(i) Write down the eqn for inst. value

(ii) Reckoning the time from the instant the current is zero and becoming +ve. Find the inst. value after $\frac{1}{360}$ sec.

(iii) Time taken to reach 96A for 1st time.

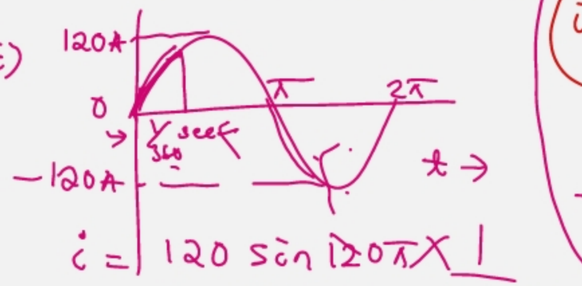
Sol^n :-

(i) $i = i_m \sin \omega t$

$= 120 \sin 2\pi \times 50 t$

$= 120 \sin 120\pi t$

(ii)




$i = 120 \sin 120\pi \times \frac{1}{360}$

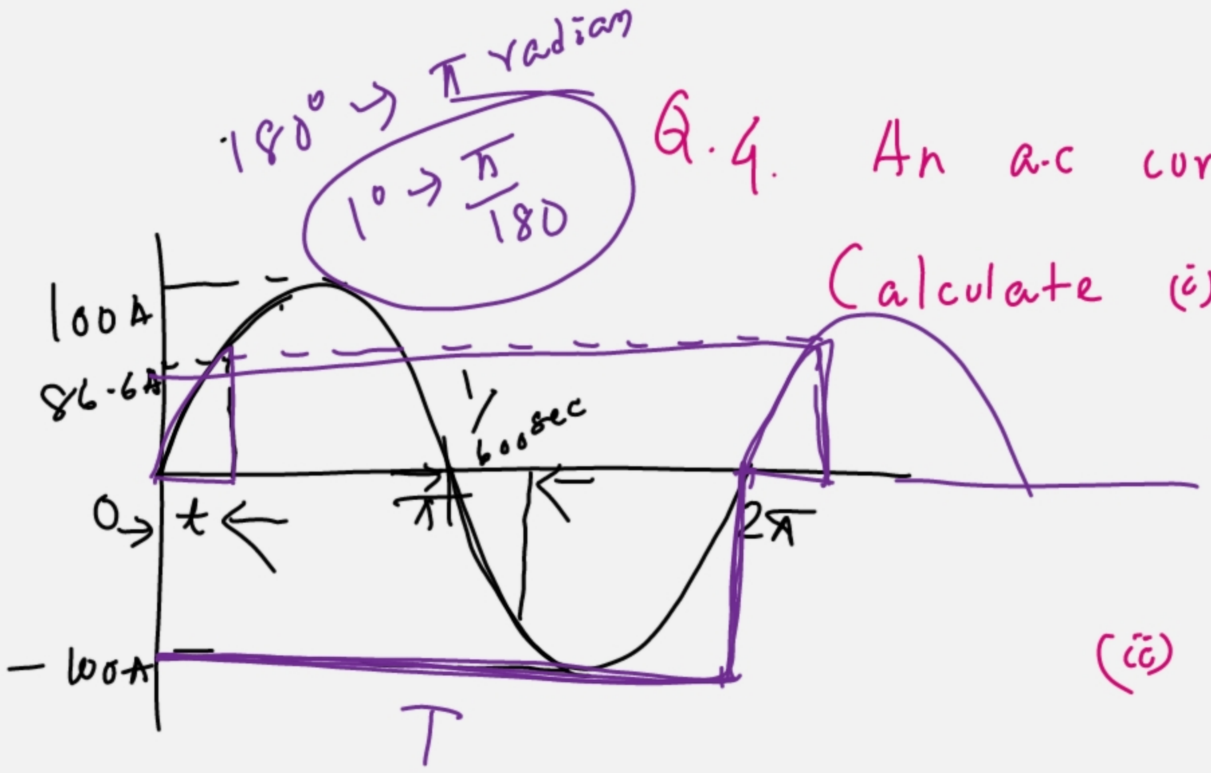
$= 120 \times \frac{\sqrt{3}}{2}$

$= 60\sqrt{3}$ A.

(iii) $96 = 120 \sin 120\pi t$

$t = \frac{1}{120\pi} \sin^{-1}\left(\frac{96}{120}\right)$

$= 2.96$ msec




Q.4. An a.c current of freq. 50Hz has max value 100A. Calculate (i) its value $\frac{1}{600}$ sec after the instant the current is zero and its value is decreasing.

(ii) how many secs after the current is zero and then increasing will attain the value of 86.6A

Soln:- (i) $i = 100 \sin(2\pi \times 50t + \pi)$

$= -100 \sin 100\pi \times \frac{1}{600}$

$-50A. = -100 \sin \pi/6$

(ii) $86.6 = 100 \sin 100\pi t$

$t = \frac{1}{100\pi} \sin^{-1}\left(\frac{86.6}{100}\right)$

$= 3.33_{ms}$