**Q.1** For an AC circuit, calculate the average value of the current per cycle, for which time function of the current is shown in the figure.



Q.2 In a given AC circuit through a specific branch, the current varies as a function of time given as

$$\mathbf{i} = \begin{cases} \mathbf{i}_{0} \sin^{2} \omega \mathbf{t}, \ \mathbf{0} \le \omega \mathbf{t} < \pi \\ \mathbf{i}_{0} \sin \omega \mathbf{t}, \ \pi \le \omega \mathbf{t} < 2\pi \end{cases}$$
Calculate the average current per cycle of this **A**C.  
(A) $\frac{i_{0}}{\pi}$  (B) $i_{0} \left(\frac{1}{4} - \frac{1}{\pi}\right)$  (C) $i_{0} \left(\frac{1}{2} - \frac{1}{\pi}\right)$  (D) $\frac{i_{0}}{\sqrt{2}}(\pi - 1)$ 

- Q.3In an AC circuit, the current is given by the equation,  $\mathbf{i} = 2\sqrt{13}\sin(50\pi t)$  A. Calculate the time taken<br/>to reach from zero (at  $\mathbf{t} = \mathbf{0}$ ) to its first maximum value.<br/>(A) 5 ms(B)10 ms(C)15 ms(D)20 ms
- **Q.4** If a direct current of **3 A** is superimposed on an alternating current  $\mathbf{i} = 4\sqrt{2}\sin\omega t \mathbf{A}$ , flowing through a wire, what is the average value of current in one complete cycle? **(A)**  $5 \mathbf{A}$  **(B)**  $4\sqrt{2} \mathbf{A}$  **(C)**  $3 \mathbf{A}$  **(D)**  $(3 + 4\sqrt{2}) \mathbf{A}$
- **Q.5** The variation in an alternating emf with time is shown below. Calculate the mean value per cycle of the given emf.



**Q.6** The current decaying in a circuit has a function  $\mathbf{i} = \mathbf{I}_0 \mathbf{e}^{-t/\tau}$  where  $\tau$  is the time constant of the circuit. Find **rms** value of the current for the period  $\mathbf{t} = \mathbf{0}$  to  $\mathbf{t} = \tau$ .

$$(\mathbf{A})_{\sqrt{2}}^{\frac{l_0}{\sqrt{2}}} \sqrt{1 - \frac{1}{e^2}} \qquad \qquad (\mathbf{B})_{\sqrt{2}}^{\frac{l_0}{\sqrt{2}}} \sqrt{1 + \frac{1}{e^2}} \qquad \qquad (\mathbf{C}) I_0 \sqrt{1 - e^2} \qquad \qquad (\mathbf{D}) I_0 \sqrt{1 + e^2}$$

**Q.7** Find the **rms** value of the sawtooth voltage of peak value **V**<sub>0</sub> per cycle, for which the time function is shown in figure.







- Q.9 Average heat produced per unit time during a cycle of AC is the same as produced by DC with current i =(A) $i_{avg}$  (B) $i_{rms}$  (C) $i_{avg}^2$  (D) $i_{peak}$
- Q.10A direct current of 5 A and an alternating current of peak value 5 A flows through resistances 1  $\Omega$ <br/>and 2  $\Omega$  respectively. Find the ratio of heat produced in the two resistances in the same interval.<br/>(A)1(B)2(C)3(D)0.5

## ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(B)	(C)	(B)	(A)	(B)	(C)	(A)	(B)	(A)	(B)