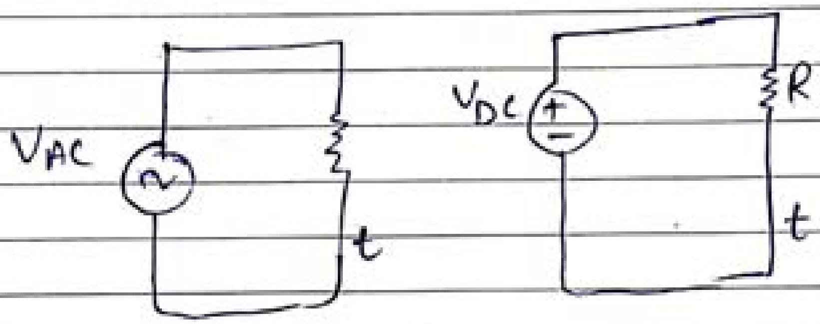
RMS Value :→

The value of voltage at which heat transfer in A·C ckt is equal to heat transfer in d.c. ckt, Provided both A·C and DC ckt have same value of resistance & operated for same time.



I^2Rt

$$W_{AC} = W_{DC}$$

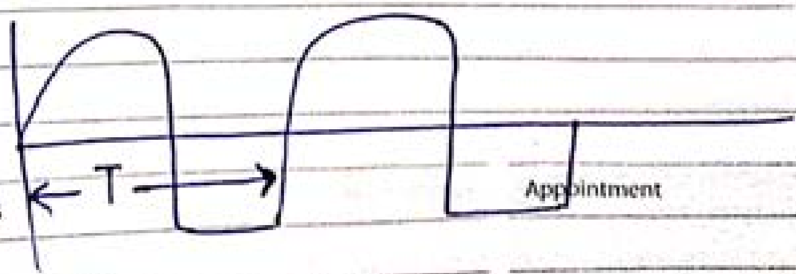
$x(t)$

$$Rms = \left[\frac{1}{T}\int_0^T [x(t)]^2\, dt\right]^{1/2}$$

T → fundamental Time Period

↳ The meaning of time at which wave form start repeating.

i.e



June'11

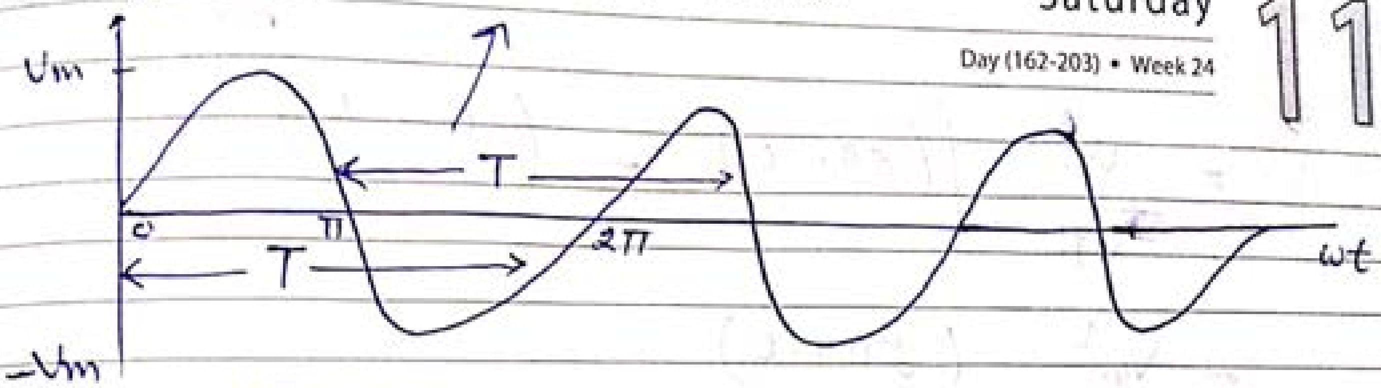
Monday		6	13	20	27
Tuesday		7	14	21	28
Wednesday	1	8	15	22	29
Thursday	2	9	16	23	30
Friday	3	10	17	24	
Saturday	4	11	18	25	

Notes

Appointment

$$T = 3\pi - \pi = 2\pi$$

(1)



$$T = 2\pi$$

$$x(t) = V_m \sin \omega t$$

$$RMS^2 = \left[\frac{1}{T}\int_0^T (x\,t)^2\,dt\right]^{1/2}$$

$$= \frac{1}{2\pi}\int_0^{2\pi} (V_m \sin \omega t)^2\, d\omega t$$

$$= \frac{1}{2\pi}\int_0^{2\pi} V_m^2 \sin^2 \omega t\, d\omega t$$

$$\sin^2\theta = \frac{1-\cos 2\theta}{2}$$

$$= \frac{V_m^2}{2\pi}\int_0^{2\pi} \sin^2 \omega t\, d\omega t$$

Sunday 12

$$= \frac{V_m^2}{2\pi}\int_0^{2\pi} \left(\frac{1-\cos 2\omega t}{2}\right) d\omega t$$

$$= \frac{V_m^2}{4\pi}\int_0^{2\pi} 1\, d\omega t - \int_0^{2\pi} \cos 2\omega t\, d\omega t$$

$$= \frac{V_m^2}{4\pi}\left[\left[\omega t\right]_0^{2\pi} - \left[\frac{\sin 2\omega t}{2}\right]_0^{2\pi}\right]$$

$$= \frac{V_m^2}{4\pi}\left[(2\pi - 0) - \left(\frac{\sin 4\pi}{2} - \frac{\sin 0}{2}\right)\right]$$

Notes

Appointment

July'11

Monday		4	11	18	25
Tuesday		5	12	19	26
Wednesday		6	13	20	27
Thursday		7	14	21	28
Friday	1	8	15	22	29
Saturday	2	9	16	23	30
Sunday	3	10	17	24	31

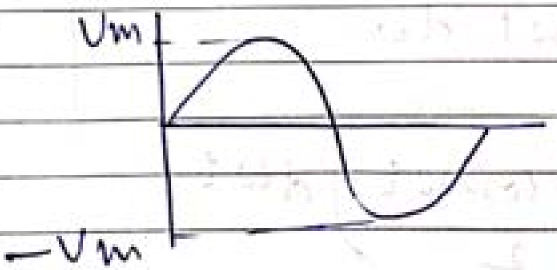
$$= \frac{V_m^2}{4\pi}\left[(2\pi - 0) - (0 - 0)\right]$$

$$= \frac{V_m^2}{4\pi}(2\pi - 0)$$

$$RMS^2 = \frac{V_m^2}{2} = \frac{\sqrt{V_m^2}}{\sqrt{2}}$$

$$\boxed{RMS = \frac{V_m}{\sqrt{2}}}$$

If a sinusoidal waveform. you have direct written



$$\rightarrow \frac{V_m}{\sqrt{2}}$$

To Remember:-

$$\int_0^{2\pi} \sin \omega t \, dt = 0$$

$$\int_0^{2\pi} \cos \omega t \, dt = 0$$

June'11

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Friday	3	10	17	24	
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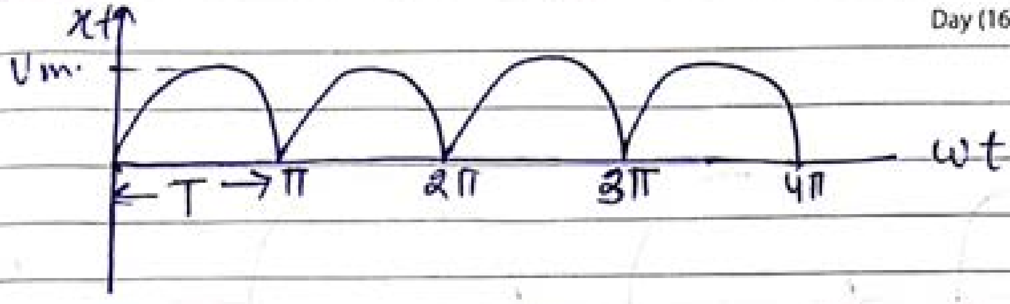
Sunday	5	12	19	26	

Notes

Appointment

(2)



$$RMS^2 = \frac{1}{T}\int_0^T [x(t)]^2\, dt$$

$$RMS^2 = \frac{1}{\pi}\int_0^\pi (V_m \sin\omega t)^2\, d\omega t$$

$$= \frac{V_m^2}{\pi}\int_0^\pi \frac{1-\cos 2\omega t}{2}\, d\omega t$$

$$= \frac{V_m^2}{2\pi}\left[\int_0^\pi \frac{1}{2}\, d\omega t - \int_0^\pi \cos 2\omega t\right]$$

$$= \frac{V_m^2}{2\pi}\left[\left[\omega t - 0\right]_0^\pi - 0\right]$$

$$= \frac{V_m^2}{2\pi}(\pi - 0)$$

$$RMS^2 = \frac{V_m^2}{2}$$

Notes

Appointment

$$\boxed{RMS = \frac{V_m}{\sqrt{2}}}$$

July'11

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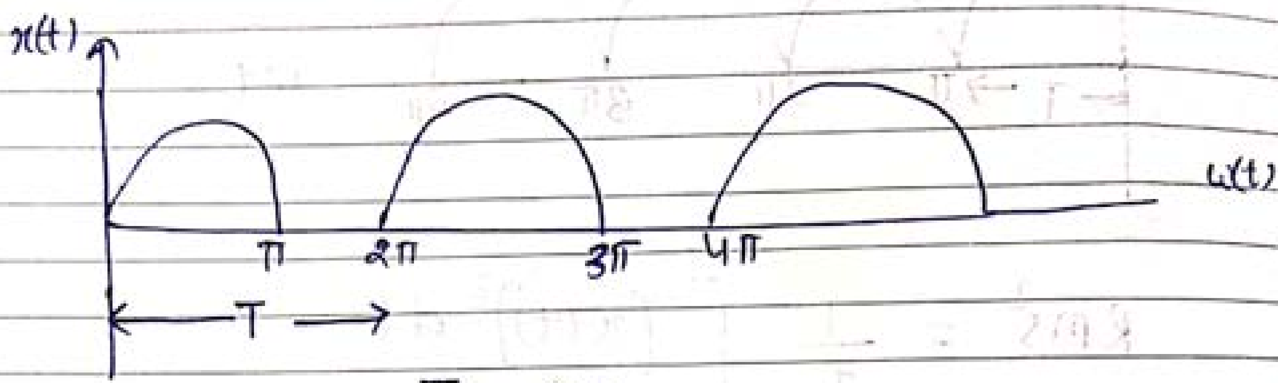
(3)



$T = 2\pi$

$$x(t) = \begin{cases} V_m \sin \omega t & 0 < \omega t < \pi \\ 0 & \pi < \omega t < 2\pi \end{cases}$$

$$Rms^2 = \frac{1}{2\pi}\int_0^{2\pi} [x(t)]^2 \, d\omega t$$

$$= \frac{1}{2\pi}\left[\int_0^{\pi} (V_m \sin \omega t)^2 \, d\omega t + \int_{\pi}^{2\pi} 0 \cdot d\omega t\right]$$

$$= \frac{V_m^2}{2\pi}\left[\int_0^{\pi} \frac{1-\cos 2\omega t}{2} \, d\omega t\right]$$

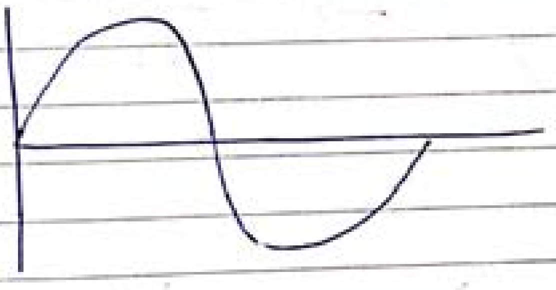
$$= \frac{V_m^2}{2\pi}\left[\int_0^{\pi} 1 \, d\omega t - \int^{\pi} \cos 2\omega t \, d\omega t\right]$$

$$Rms^2 = \frac{V_m^2}{4\pi} \cdot \pi$$

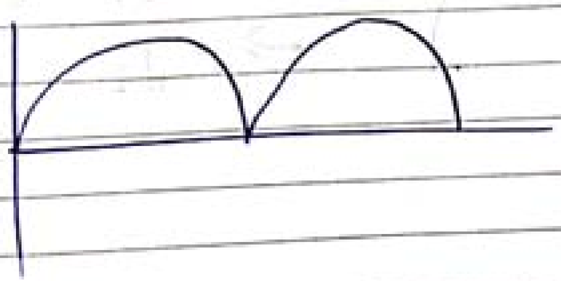
$$Rms^2 = \frac{V_m^2}{4}$$

$$\boxed{Rms = \frac{V_m}{2}}$$

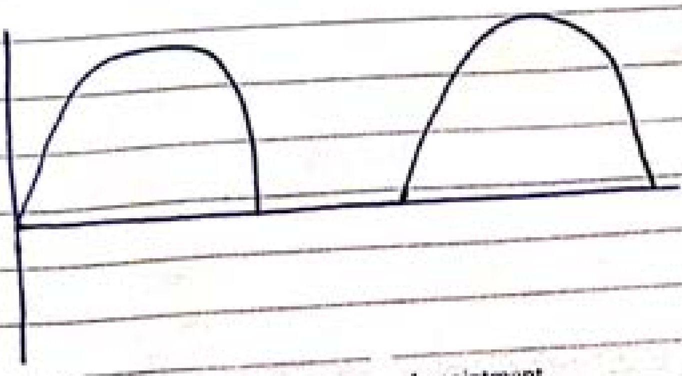
Sc.



$\Rightarrow V_m/\sqrt{2}$



$\Rightarrow V_m/\sqrt{2}$



$\Rightarrow \frac{V_m}{2}$.

Notes

Appointment

July'11

Monday		4	11	18	25
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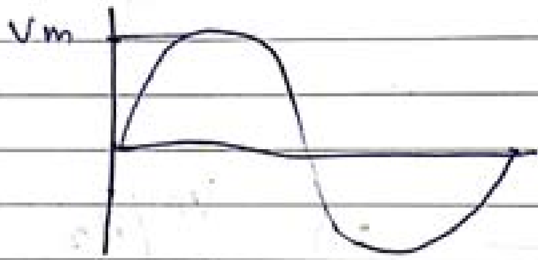
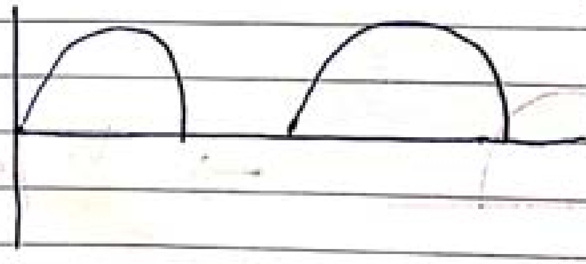
NOTE :→

If Area is reduced by factor n then RMS value is reduced by factor $\sqrt{n}$.

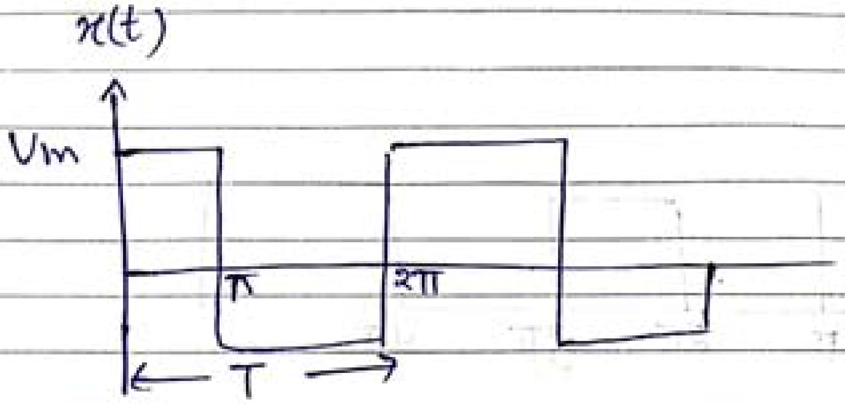


$\rightarrow \frac{V_m}{\sqrt{2}}$



$\rightarrow \frac{V_m}{\sqrt{2}} \times \frac{1}{\sqrt{2}}$

(4)



$$x t = \begin{cases} V_m, & 0 < t < \pi \\ -V_m, & \pi < t < 2\pi \end{cases}$$

$$Rms = \left[\frac{1}{T}\int_0^T [x(t)]^2 dt\right]^{1/2}$$

$$Rms^2 = \frac{1}{2\pi}\left[\int_0^{\pi} V_m^2 \, d\omega t + \int_{\pi}^{2\pi} (-V_m)^2 d\omega t\right]$$

$$= \frac{V_m^2}{2\pi}\left[\int_0^{\pi} 1 \, d\omega t + \int_{\pi}^{2\pi} +1 \, d\omega t\right]$$

Sunday 19

$$= \frac{V_m^2}{2\pi}\left[[\omega t]_0^{\pi} + [\omega t]_{\pi}^{2\pi}\right]$$

$$= \frac{V_m^2}{2\pi}\left[(\pi - 0) + (2\pi - (+\pi))\right]$$

Notes Appointment

$$= \frac{V_m^2}{2\pi}\left[\pi + \pi\right]$$

$$Rms^2 = V_m^2$$

$$\boxed{Rms = V_m}$$

July'11

Monday		4	11	18	25
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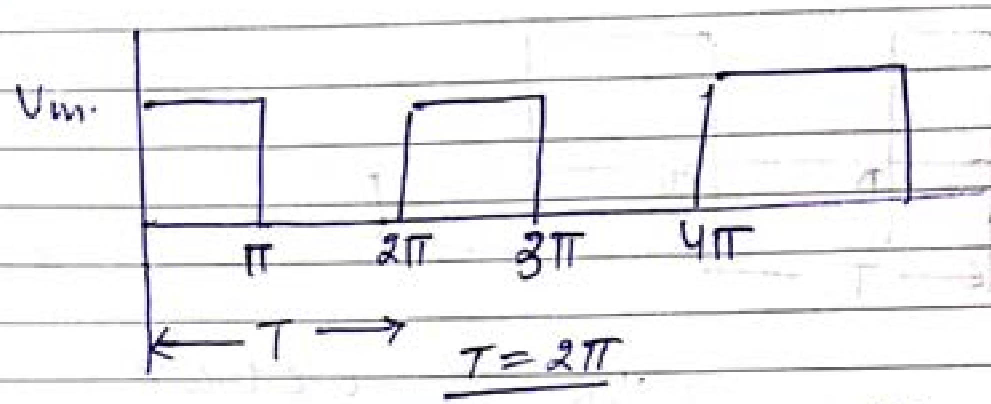
(5)



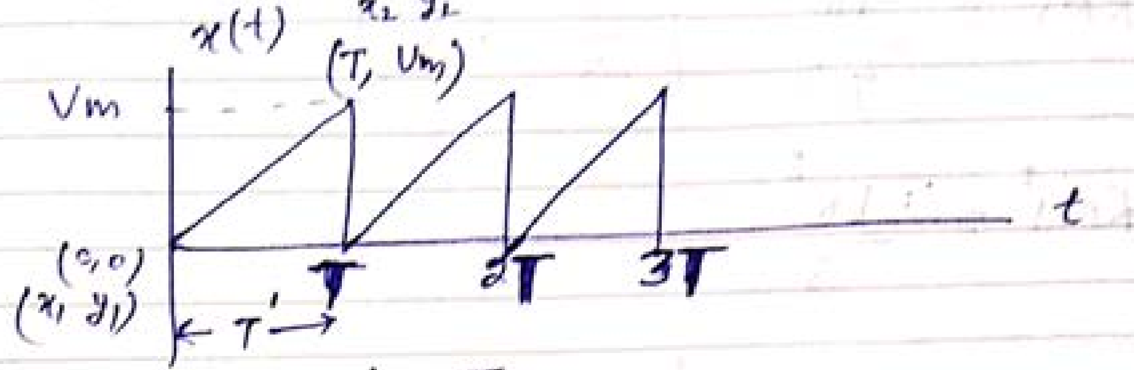
$$RMS^2 = \frac{1}{2\pi}\int_0^{\pi}(V_m)^2\,d\omega t + \int_{\pi}^{2\pi} 0 \cdot d\omega t$$

$$RMS^2 = \frac{1 \times V_m^2}{2\pi}\int_0^{\pi} 1\,d\omega t$$

$$RMS^2 = \frac{V_m^2}{2\pi} \times \pi =$$

$$\boxed{RMS = \frac{V_m}{\sqrt{2}}}$$

(6) Saw tooth wave form



$T' = T$

$$RMS = \left[\frac{1}{T}\int_0^T [x(t)]^2\,dt\right]^{1/2}$$

find the value of $x(t)$

method 1

$$(y - y_1) = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1).$$ [straight line formula.

$$x(t) - 0 = \frac{Vm - 0}{T - 0}(t - 0)$$

$$x(t) = \frac{Vm}{T}t$$

$$\Rightarrow RMS^2 = \frac{1}{T}\int_0^T \left(\frac{Vm}{T}t\right)^2 dt$$

Notes

Appointment

$$RMS^2 = \frac{V_m^2}{T^3}\int_0^T t^2\,dt.$$

$$= \frac{V_m^2}{T^3}\left[\frac{t^3}{3}\right]_0^T$$

July'11

Monday		4	11	18	25
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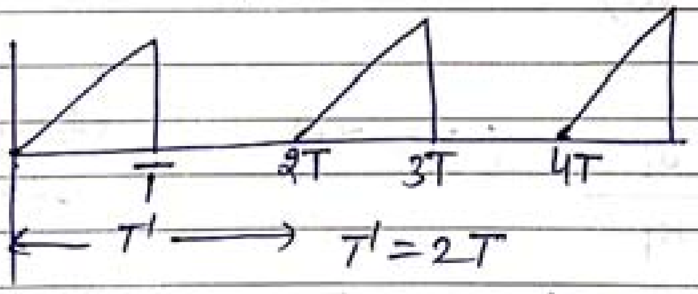
Sunday	3	10	17	24	31

$$RMS^2 = \frac{V_m^2}{T^3}\left[\frac{T^3}{3} - 0\right]$$

$$RMS^2 = \frac{V_m^2}{3}$$

$$\boxed{RMS = \frac{V_m}{\sqrt{3}}}$$

(7) If wave form is



→ $\frac{V_m}{\sqrt{3}}$ RMS

we can direct write.

$$RMS = \frac{V_m}{\sqrt{3}} \times \frac{1}{\sqrt{2}}$$

$$= \frac{V_m}{\sqrt{6}}$$

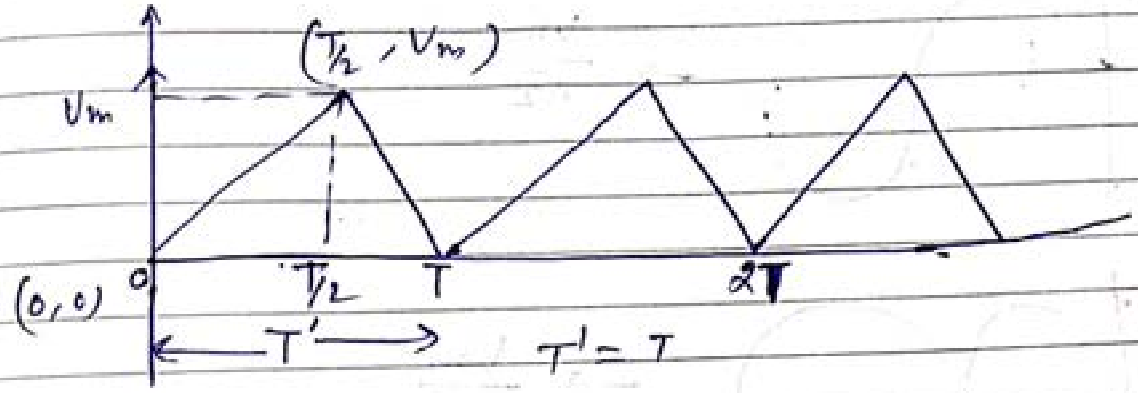
June'11

Monday		6	13	20	27
Tuesday		7	14	21	28
Wednesday	1	8	15	22	29
Thursday	2	9	16	23	30
Friday	3	10	17	24	
Saturday	4	11	18	25	
Sunday	5	12	19	26	

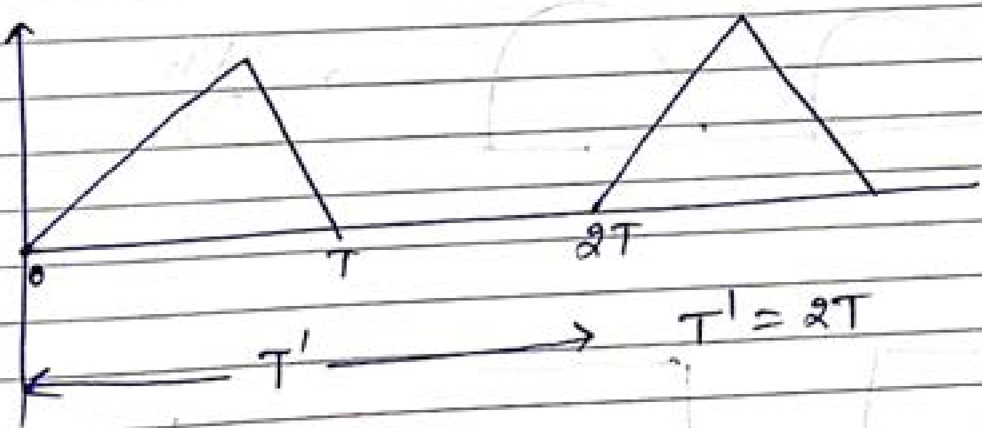
Notes

Appointment

(8) Tringular wave form :-



$\Rightarrow \frac{V_m}{\sqrt{3}}$

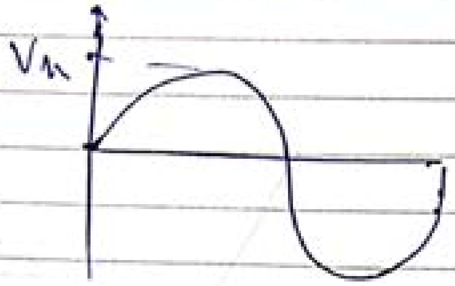


$$\Rightarrow \frac{V_m}{\sqrt{3}} \times \frac{1}{\sqrt{2}}$$

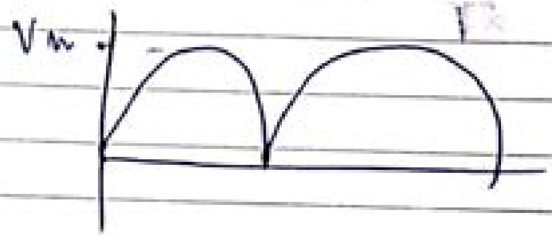
$$RMS \Rightarrow \frac{V_m}{\sqrt{6}}$$

Conclusion of all wave form

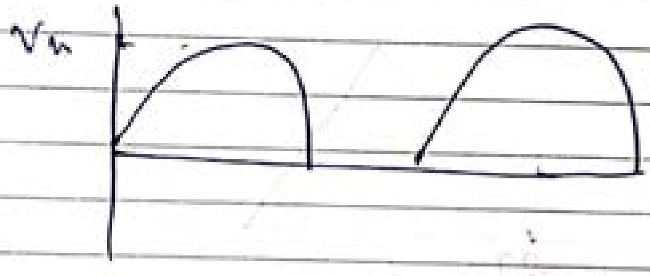
(1)



$\rightarrow \frac{V_m}{\sqrt{2}}$

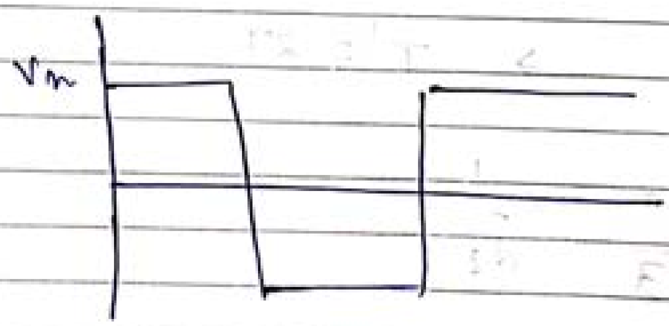


$\rightarrow \frac{V_m}{\sqrt{2}}$

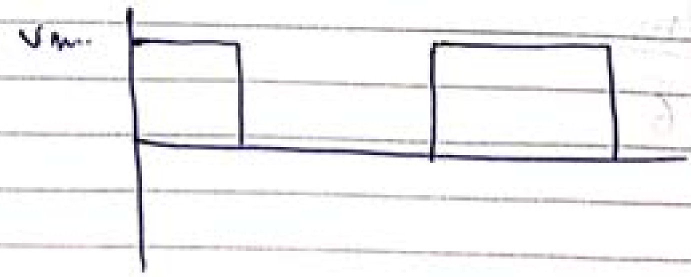


$\rightarrow \frac{V_m}{2}$

(2)



$\rightarrow V_m$



$\rightarrow \frac{V_m}{\sqrt{2}}$

June'11

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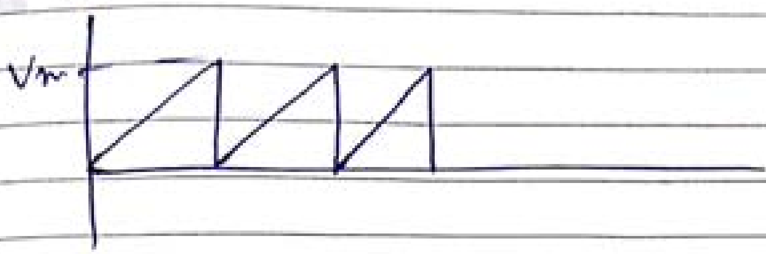
Sunday	5	12	19	26	

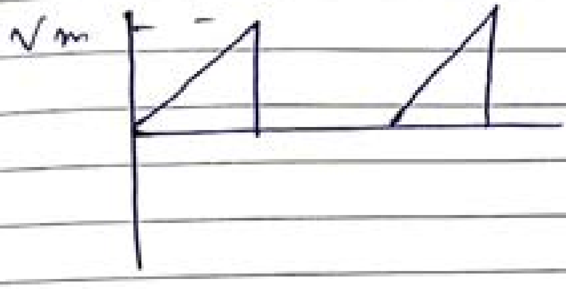
Notes

Appointment

(3)

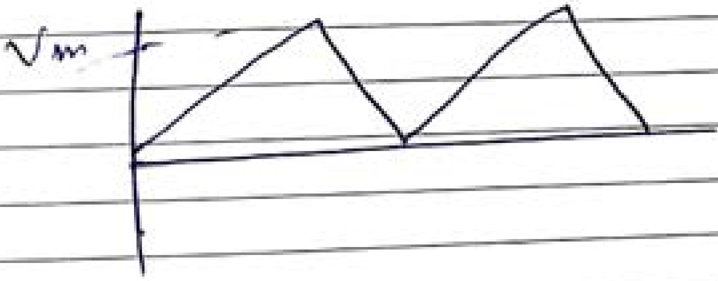


→ $\frac{V_m}{\sqrt{3}}$

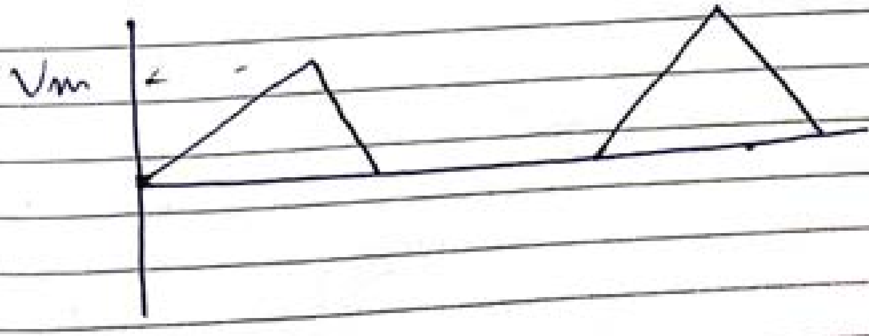


→ $\frac{V_m}{\sqrt{6}}$

(4)



→ $\frac{V_m}{\sqrt{3}}$



→ $\frac{V_m}{\sqrt{6}}$

Sunday 26

Notes

Appointment

July'11

Monday		4	11	18	25
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