

Answer on Question # 76724, Physics -Electric Circuits:

Question: The waveform of a voltage in an electrical circuit has the following parameters:

i . A continuous series of right-angled triangles, each with a base length equivalent to 3 ms

ii . 9 V maximum

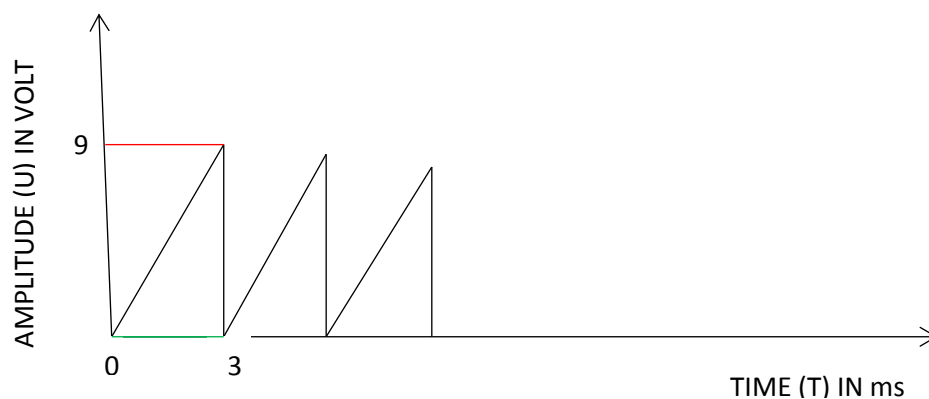
iii . Voltage ramps up over the 3 ms and then drops back to zero instantaneously

iv . Sketch the waveform and mark on the relevant parameters.

v . Derive the function which defines the waveform.

vi . Using integral calculus, find the RMS value of the voltage.

Solution: Wave function is given by :



In the above wave function green line indicates the time and red line indicates the maximum amplitude of the signal.

Here, maximum amplitude $V_p = 9$ volt.

Time period (T) = 3 ms.

Wave function is given by:

$$U = \frac{9-0}{3-0}t$$
$$= 3t \quad 0 \leq t < 3$$

Now, let ,RMS value of the voltage is U_{RMS} .

$$U_{\text{RMS}}^2 = \frac{1}{T} \int [9t^2] dt \quad , \text{ here integral limit is 0 to 3 and } T = 3.$$

Now, $U_{\text{RMS}}^2 = 9$ or, $U_{\text{RMS}} = 3$ volt.

Answer: RMS value of the voltage is 3 volt.

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