1. A ramp shown in **Figure 1.1** is applied to a high-pass **RC** circuit. Draw to scale the output waveform for the cases: (i) $T = RC$, (ii) $T = 0.2\,RC$, (iii) $T = 5\,RC$.
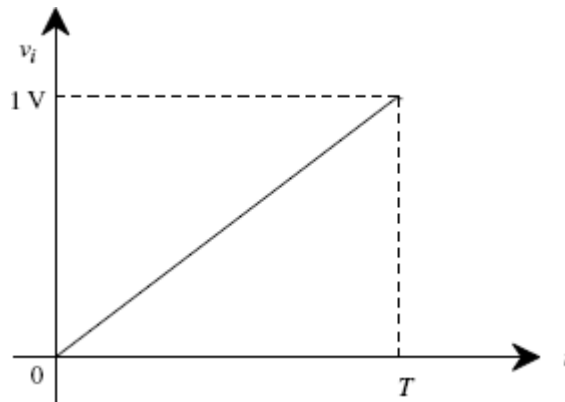

Figure 1.1 A ramp as input

2. A waveform shown in **Figure 1.2** is applied as input to a **RC** high pass circuit whose time constant is 250 ps. If the maximum output voltage across the resistor is 50 V, what is the peak value of the input waveform?
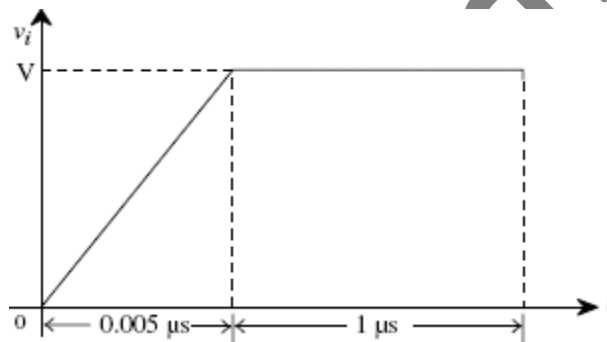

Figure 1.2 Input to the high-pass **RC** circuit

3. A limited ramp shown in **Figure 1.3** is applied to a **RC** high-pass circuit of . The time constant of the **RC** circuit is 2 ms. Calculate the maximum value of the output voltage and the output at the end of the input waveform.
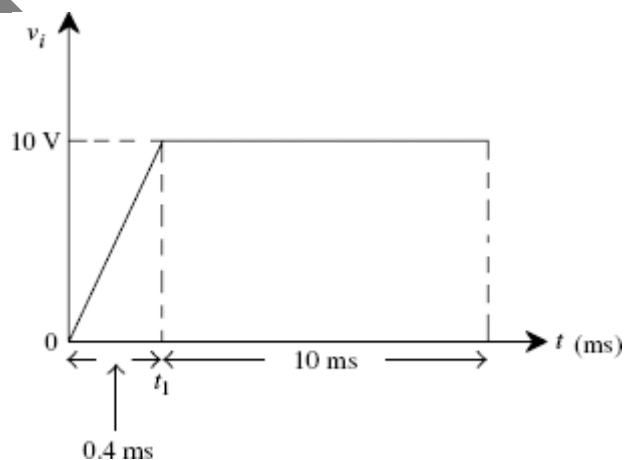

Figure 1.3 Input to the high-pass circuit

4. The periodic waveform shown in **Figure 1.4** is applied to an **RC** differentiating circuit whose time constant is $10\,\mu$s. Sketch the output and calculate the maximum and minimum values of the output voltage with respect to the ground.
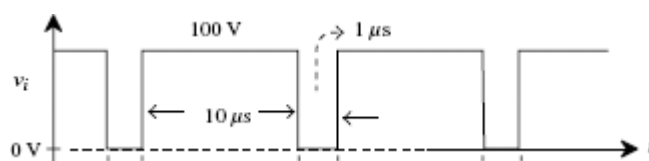

Figure 1.4 Periodic square wave as an input to the high-pass circuit

5. The periodic ramp voltage as shown in **Figure 1.5** is applied to a high-pass **RC** circuit. Find equations from which to determine the steady-state output waveform when $T_1 = T_2 = RC$.
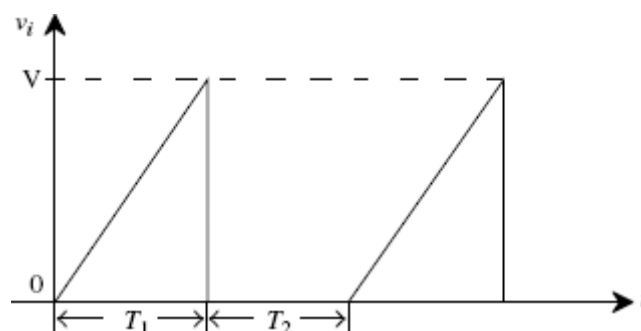

Figure 1.5 A periodic ramp as input

6. A square wave of pulse width 2 ms and peak amplitude of 12 V as shown in **Figure 1.6** is applied to high-pass **RC** circuit with time constant 4 ms. Plot the first four cycles of the output waveform.
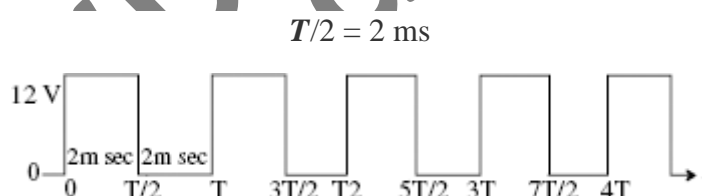
$$T/2 = 2 \text{ ms}$$

Figure 1.6 Symmetric square wave as an input

7. A 20-Hz symmetric square wave, referenced to zero volts, and with a peak-to-peak amplitude of 10 V is fed to an amplifier through the coupling network shown in **Figure 1.7**. Calculate and plot the output waveform when the lower 3-dB frequency is: (i) 0.6 Hz, (ii) 6 Hz, (iii) 60 Hz.
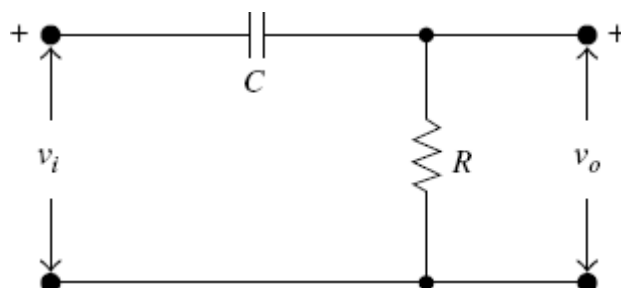

Figure 1.7 The given coupling network

8. A square wave is applied as input to an amplifier through a coupling condenser of $10\,\mu$F. The amplifier has input resistance of $10\ \text{k}\Omega$. Determine the lowest frequency if the tilt is not to exceed 10 per cent.

9. A pulse of 10 V amplitude and duration 1ms is applied to a high-pass RC circuit with $R = 20$ kΩ and $C = 0.5$ μF. Plot the output waveform to scale and calculate the per cent tilt in the output.

10. The input to the high-pass circuit is the waveform shown in Figure 1.8 . Calculate and plot the output waveform to scale, given that $RC = \tau = 0.1$ ms.
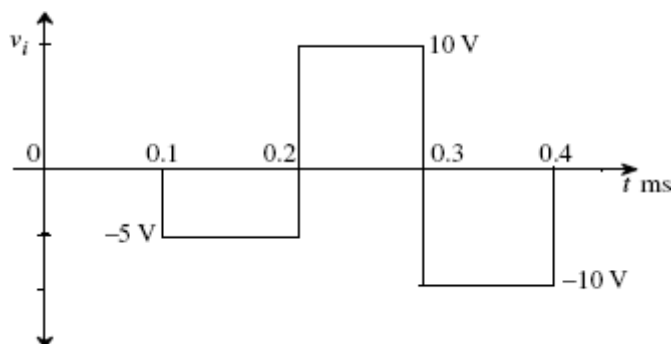

FIGURE 2p.8 Input to the high-pass circuit

11. A pulse of 10-Volt amplitude with a pulse width of 0.5 ms, as shown in Figure 1.9, is applied to a high-pass RC circuit of Fig. 2.1(a), having time constant 10 ms. Sketch the output waveform and determine the per cent tilt in the output.
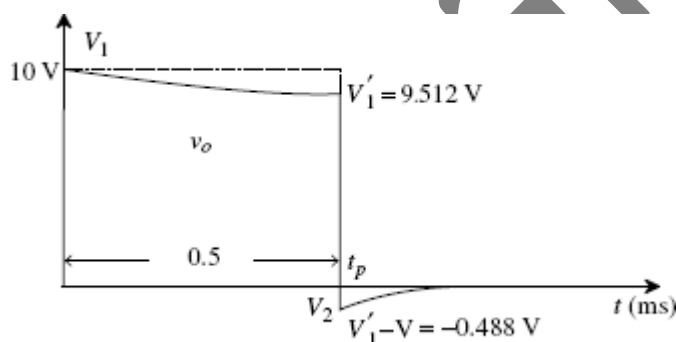

Figure 1.9 Input and output of the high-pass circuit

12. A high-pass RC circuit is desired to pass a 3-ms sweep (ramp input) with less than 0.4 per cent transmission error. Calculate the highest possible value of the lower 3-dB frequency.

13. A symmetric square wave with $f = 500$ Hz shown in Figure 1.10 is fed to an RC high-pass network of Fig. 2.1(a). Calculate and plot the transient and the steady-state response if: (a) $\tau = 5\,T$ and (b) $\tau = T/20$.
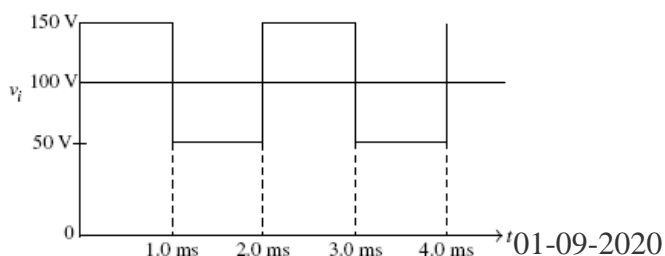

Figure 1.10 Input to the coupling network

14. A current pulse of amplitude 5A in Figure 1.11 is applied to a parallel RC combination shown in Figure 1.12. Plot to scale the waveforms of the current flowing through the capacitor for the cases: (i) $t_p = 0.1\,RC$ (ii) $t_p = RC$, (iii) $t_p = 5RC$.
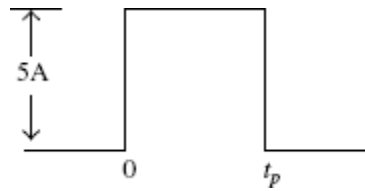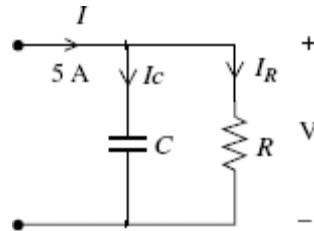
Figure 1.11 The given input to the circuit

Figure 1.12 The given circuit

15. Draw the output waveform if the waveform shown in **Figure** 1.13 is applied at the input of the **RC** circuit shown in **Figure** 1.14.
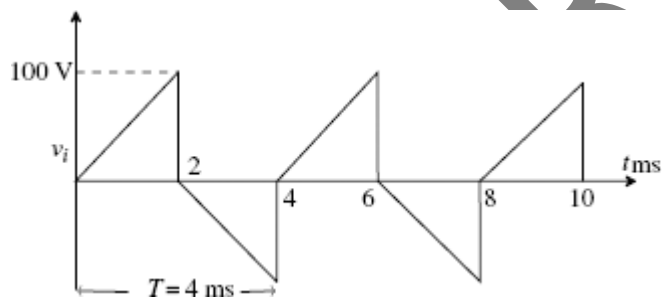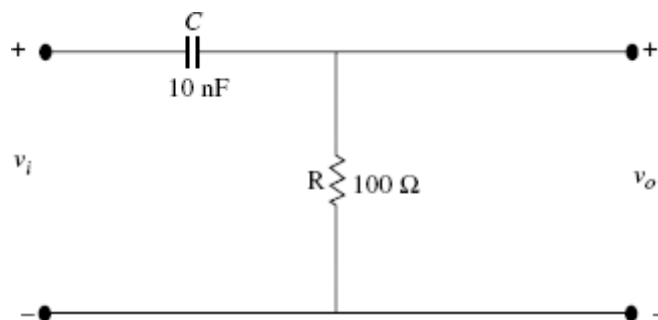

Figure 1.13 The input to the high-pass circuit .

Figure 1.14 The given high-pass circuit