CSE251 - Section - 22

Assignment - 03

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Answer to the Question No-01
(Full-wave)

(a)

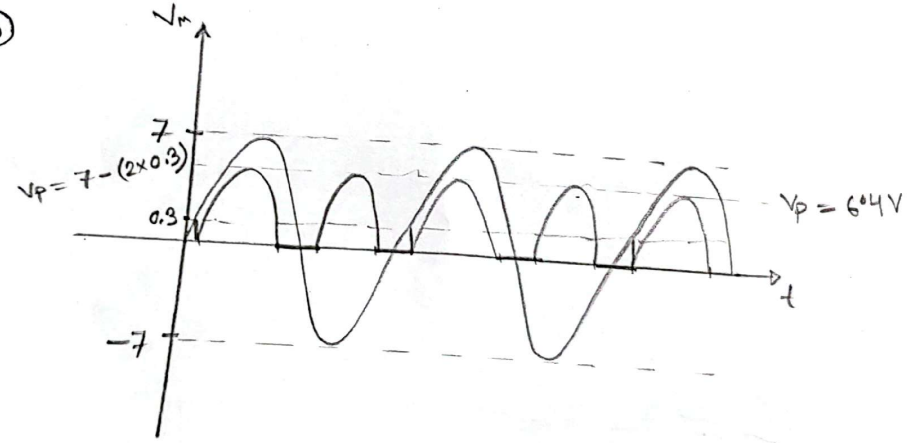
$V_s(t) = 7\sin(400\pi t)$

$\omega = 400\pi$

$2\pi f_i = 400\pi$

$f_i = 200$ Hz, (Input) $f_r = 2 \times 200 = 400$ Hz (output)

(b)



(c)

$$V_{DC_1} = V_{avg} = \frac{2V_m}{\pi} - 2V_{D_0}$$

$$= \frac{2 \times 7}{\pi} - (2 \times 0.3)$$

$$= 3.856V.$$

After connecting a capacitor, $C = 100\,\mu F$

(d)

Ripple voltage, $V_{r(p-p)} = \frac{V_p}{f_r R C} = \frac{V_m - (V_{D_0} \times 2)}{f_r R C}$

$= \frac{7 - (2 \times 0.3)}{400 \times 5 \times 10^3 \times 100 \times 10^{-6}}$

$= 0.032$

(e)

$V_{DC_2} = V_p - \frac{V_r}{2}$

$= \{7 - (2 \times 0.3)\} - \frac{0.032}{2}$

$= 6.384\,V$

$\Delta V_{DC} = V_{DC_2} - V_{DC_1} = (6.384 - 3.856)$

$= 2.528\,V$

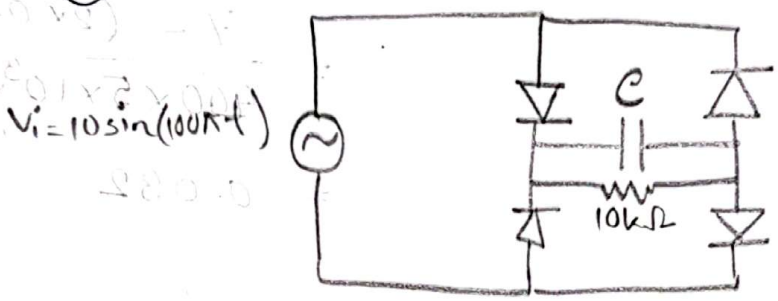
(f) To make the rectifier output smoother, add a bigger capacitor to reduce ripples, or use a combination of an inductor and capacitor for better results. In terms of getting more time constant (τ), the more get smoother dc signals.

(g) The frequency of the Ripple voltage is 400 Hz.

Answer to the Question No-02

(Full-wave)

(a)



(b)

peak output voltage, $V_p = \{10 - (2\times 0.8)\}$

$= 8.4\,V$

peak to peak ripple voltage, $V_{r(p-p)} = \frac{3}{100} \times V_p$

$= \frac{3}{100} \times 8.4$

$= 0.252\,V$

(c) $V_{DC} = V_{avg} = V_p - \frac{V_r}{2}$

$= 8.4 - \frac{0.252}{2} = 8.274\,V.$

(d) $V_r = \frac{V_p}{f_r RC}$

$\Rightarrow 0.252 = \frac{8.4}{100\times 10\times 10^3 \times C}$

$\Rightarrow C = 3.33\times 10^{-5}\,F$

↳ capacitor

$V_m = 10V$

$\omega = 100\pi$

~~$2\pi f_i$~~ $f_i = 50\,Hz$

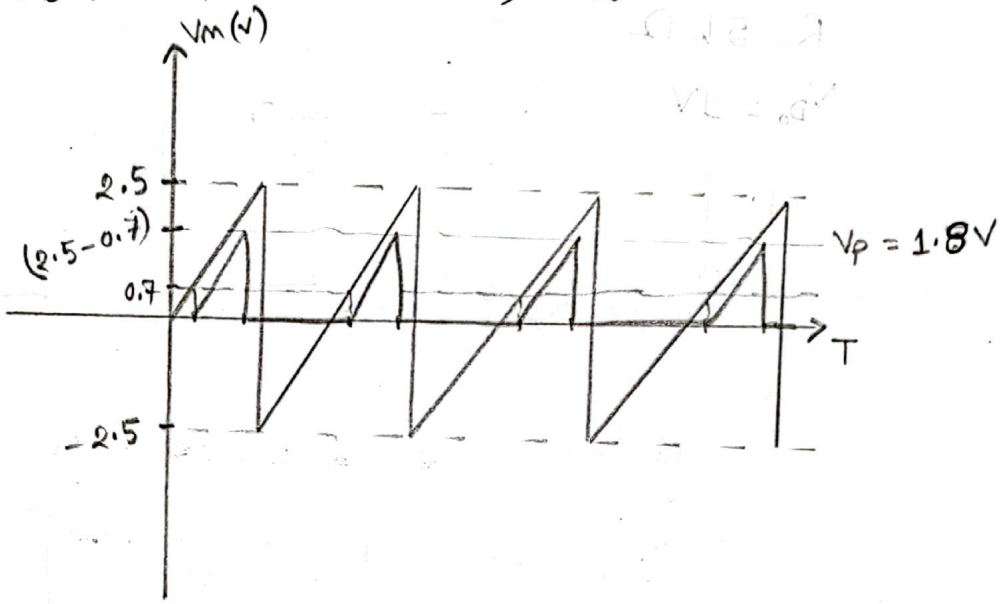
$f_r = 100\,Hz$

Answer to the Question No-03

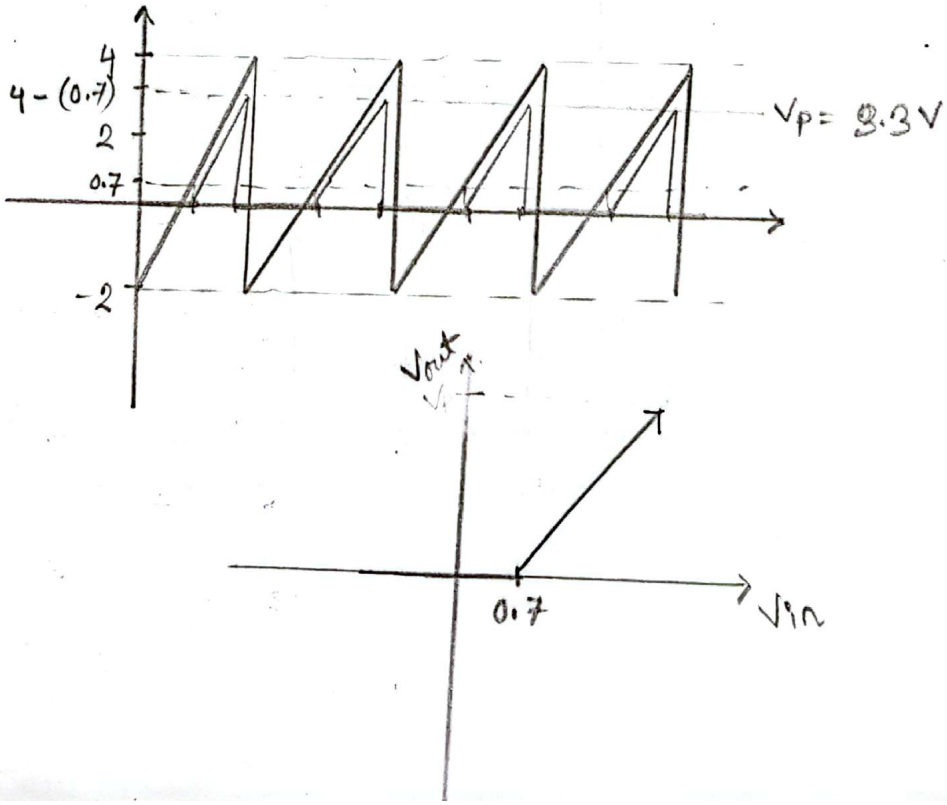
(a) (Half-wave) → Triangular-wave

$V_{i(P-P)} = 5$

$V_m = 2.5\,V$, $R = 1\,K\Omega$, $V_{D_o} = 0.7\,V$



(b)



Answer to the Question No-04
(Half-wave = Square)

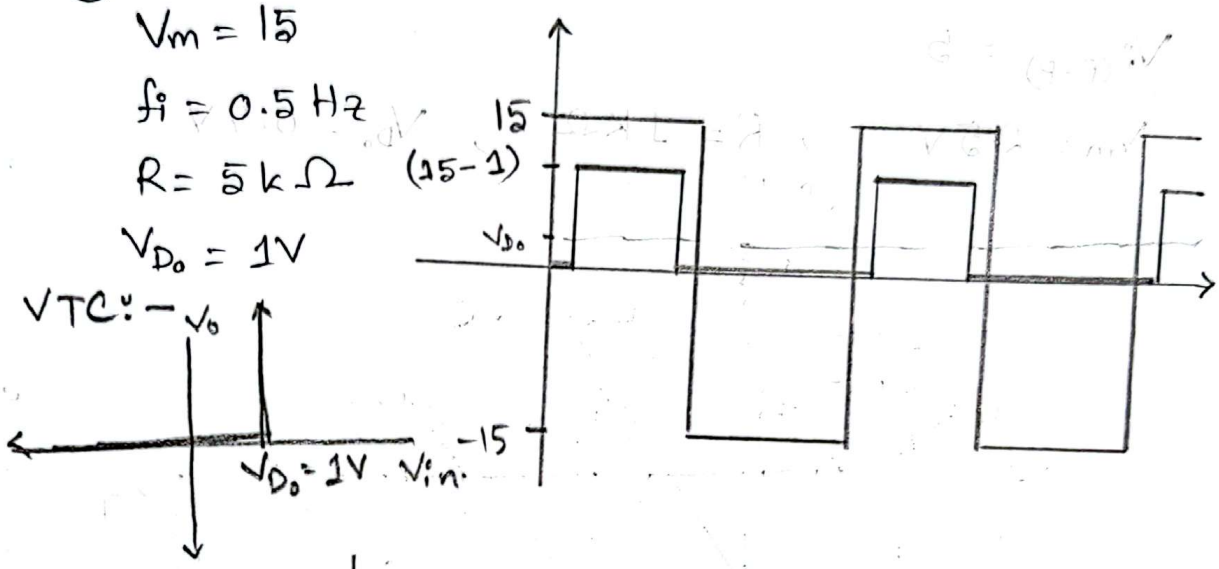
(a)

$V_m = 15$

$f_i = 0.5\ Hz$

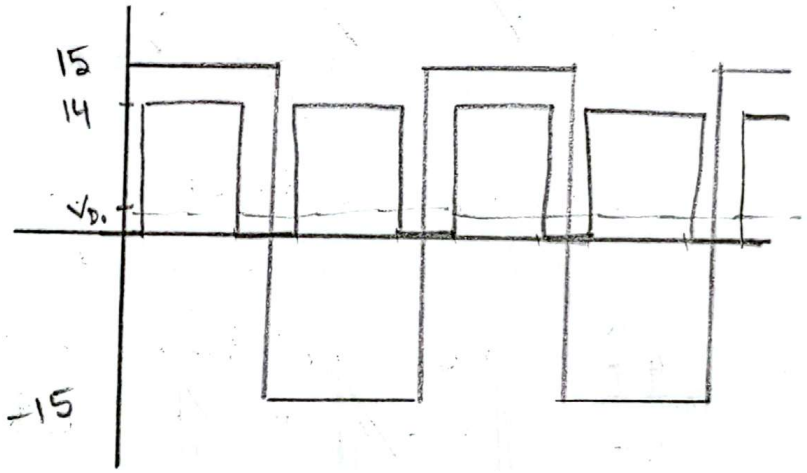
$R = 5\ k\Omega$

$V_{D_0} = 1V$

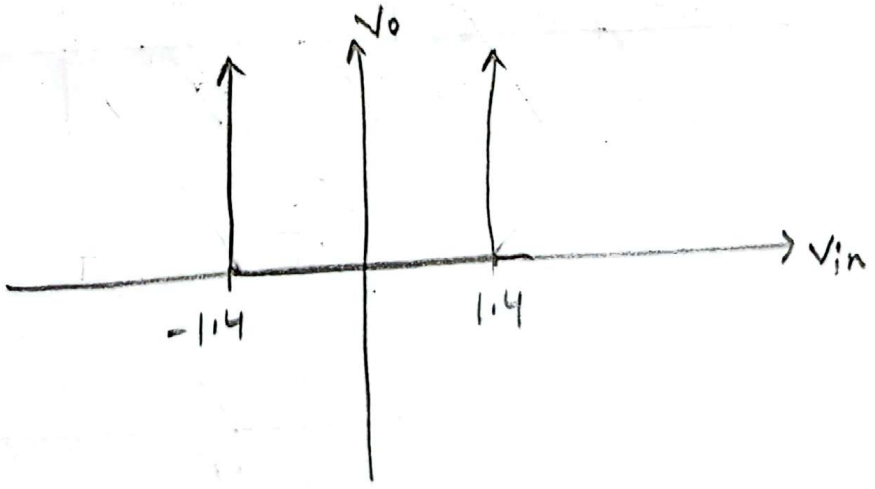


VTC:-

(b)

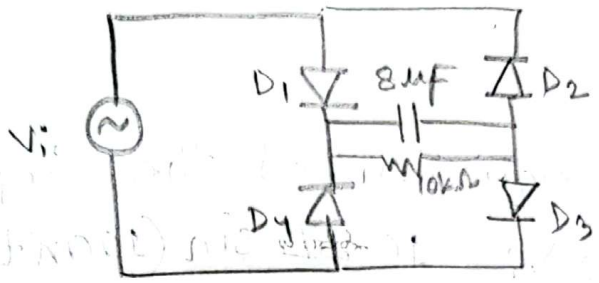


VTC



Answer to the Question No-05
(Full-wave with Capacitor)

(a)



(b) $R = 10 \times 10^3 \Omega$, $C = 8 \times 10^{-6} F$

$I_{avg} = 0.75 mA$ $f_r = 100 Hz$ $f_i = 50 Hz$

$V_{D_0} = 1V$

$V_{avg} = I_{avg} \times R = 0.75 \times 10^{-3} \times 10 \times 10^3 = 7.5 V$

We know,

$V_{avg} = V_p - \frac{V_r}{2}$

$\Rightarrow 7.5 = (V_m - 2V_{D_0}) \left(1 - \frac{1}{2 \times 100 \times 10 \times 8 \times 10^{-3}}\right)$

$\Rightarrow V_m - 2V_{D_0} = 8$ [illegible] $= V_p$

$\Rightarrow V_m = 8$ [illegible] $+ 2V_{D_0}$

$V_m = 10$ [illegible] V

$\omega = 2\pi f_i$

$= 2\pi \times 50$

$\omega = 100\pi$

So, the equation of the input waveform $\Rightarrow V_i = 10 \sin(100\pi t)$

(c)