Q1. (a) $V_{DC} = \frac{2}{\pi} \times V_M$

$= \frac{2}{\pi} \times V_{RMS} \times \sqrt{2}$

$= \frac{2\sqrt{2}}{\pi} \times 220 = 198\ V$

(b) Output DC voltage $V_{DC} = 50V$

Diode resistance, $r_f = 25\Omega$

Load resistance $R_L = 800\Omega$

Let V_m be maximum value of a.c. voltage required

$$V_{dc} = \frac{V_M}{\pi}\left(\frac{R_L}{r_f + R_L}\right)$$

or $$50 = \frac{V_M(800)}{\pi(25+800)}$$

or $V_M = 162V$

Hence, a.c. voltage of maximum value 162 V is required.

(c) RMS primary voltage = 230 V

$\therefore$ RMS secondary voltage

$$= \left(230 \times 1/5\right) = 46\,V$$

Maximum voltage across secondary

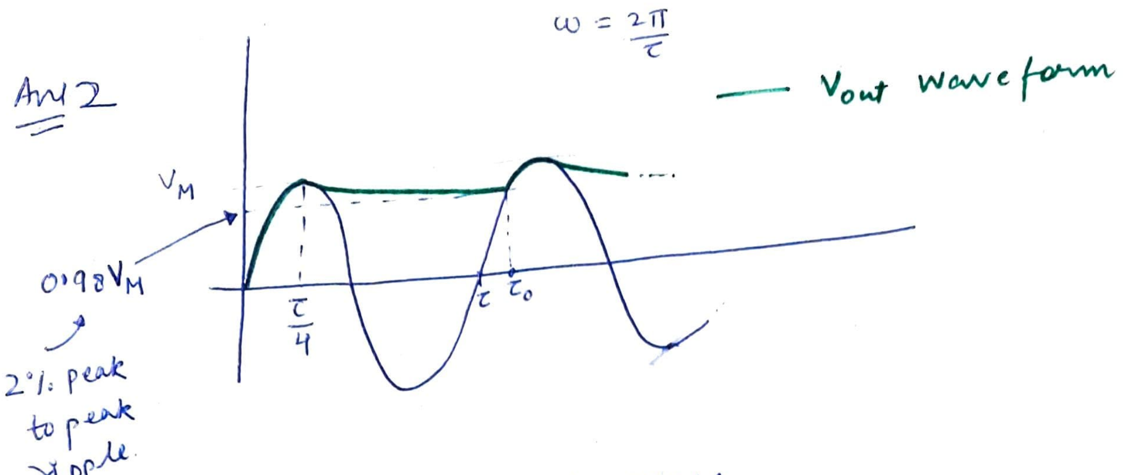
$$= 46\sqrt{2} = 65\,V$$

Maximum voltage across half secondary winding $= \dfrac{V_M}{2} = 32.5\,V$

Average current, $I_{dc} = \dfrac{2\,V_M}{\pi R_L}$

$$= 0.207\,A$$

Ans 2



when Vout is decaying:

$$V_{out} = V_M e^{-\frac{(t - \tau/4)}{RC}}$$

for small values of x, $e^x \approx 1 + x$

assuming $RC >> \tau$

$$\Rightarrow \quad V_{out} = V_M \left(1 - \frac{(t - \tau/4)}{RC}\right)$$

At τ_0, $\quad V_M \sin(\omega \tau_0) = 0.98\, V_M$

$$\Rightarrow \quad \omega \tau_0 = 2\pi + 78.5^\circ \left(\frac{\pi}{180}\right)$$

$$\Rightarrow \quad \tau_0 = \tau\left(1 + \frac{78.5^\circ}{360^\circ}\right)$$

$$\boxed{\tau_0 = 1.218\,\tau}$$

at τ_0 Vout is also equal to $0.98\, V_M$

$$\Rightarrow \quad V_M \left(1 - \frac{(\tau_0 - \tau/4)}{RC}\right) = 0.98\, V_M$$

$$\Rightarrow \quad \frac{\tau_0 - \tau/4}{RC} = 0.02$$

$$\Rightarrow \quad RC = 50\,(\tau_0 - \tau/4)$$

$$= 50\,(1.218\tau - 0.25\tau)$$

$$\boxed{RC = 48.4\,\tau}$$