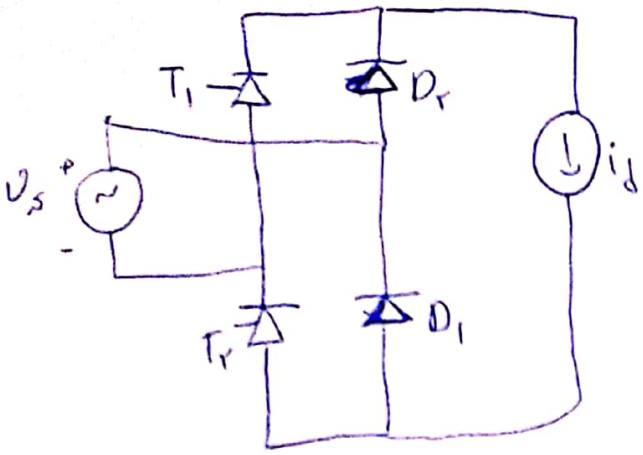
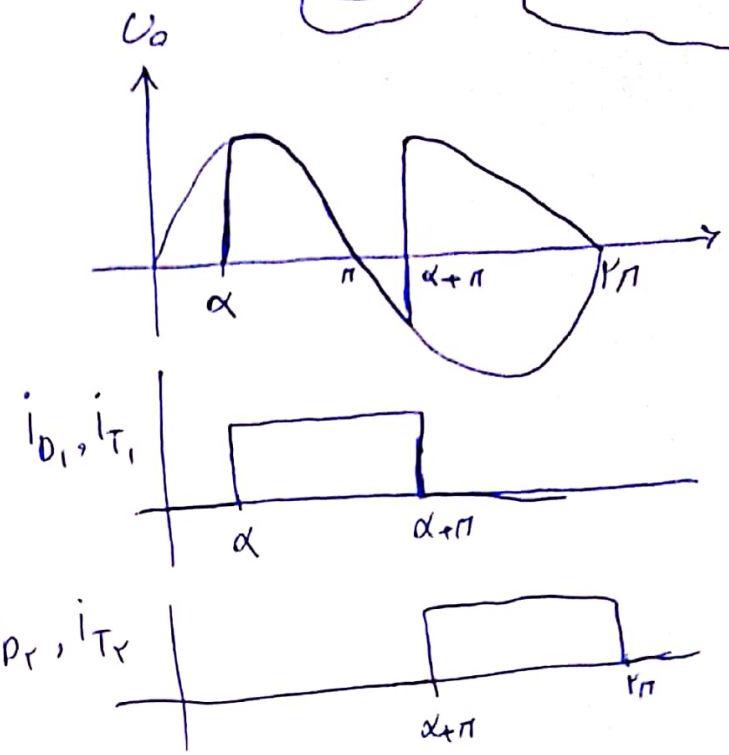
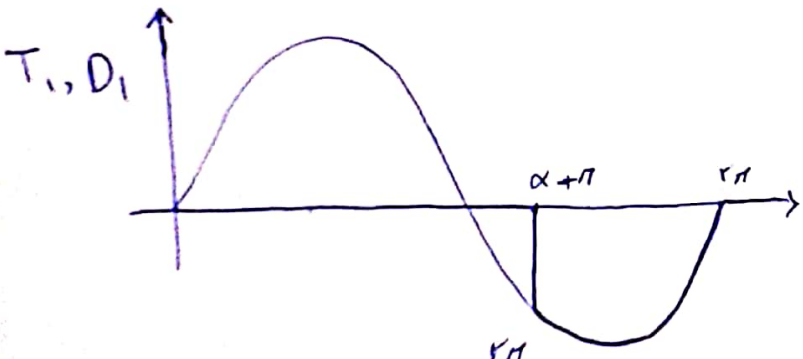
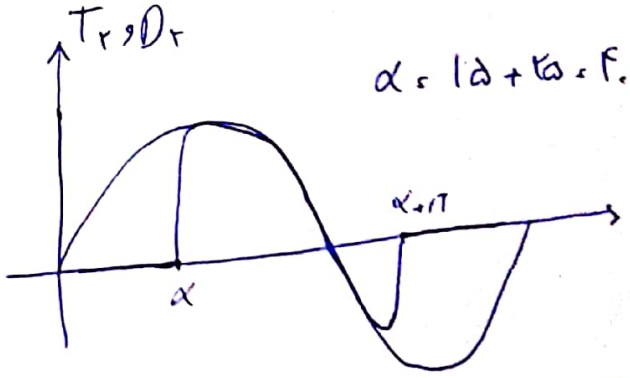
حل مسئله ① الف









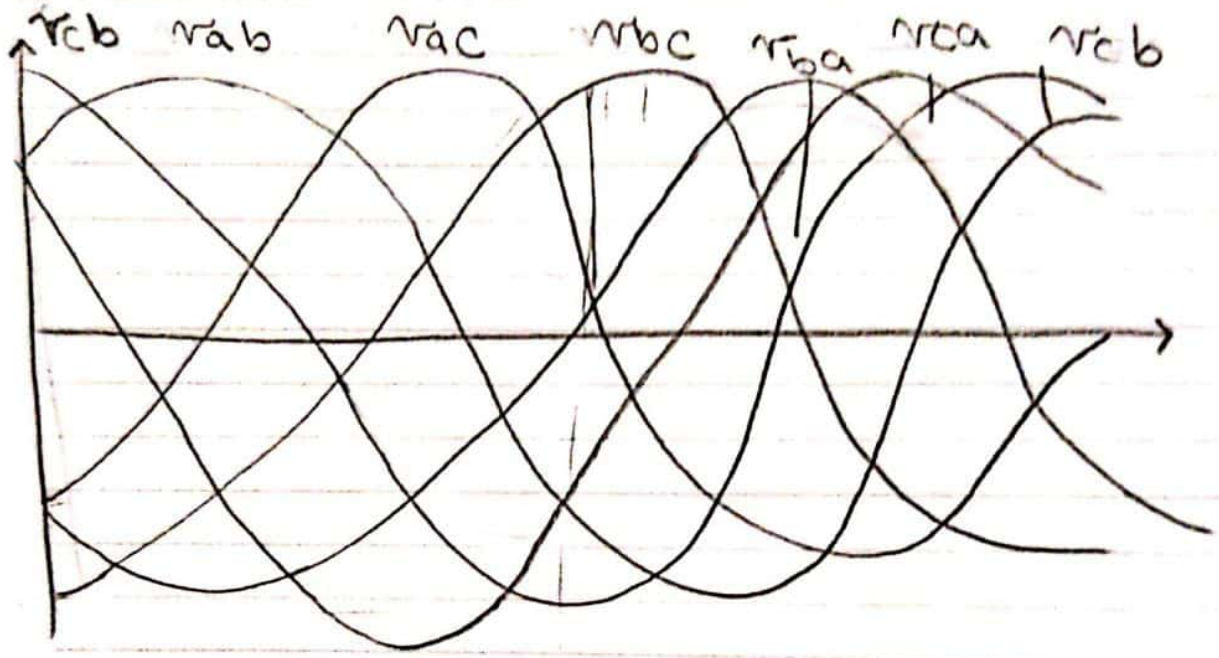
ب

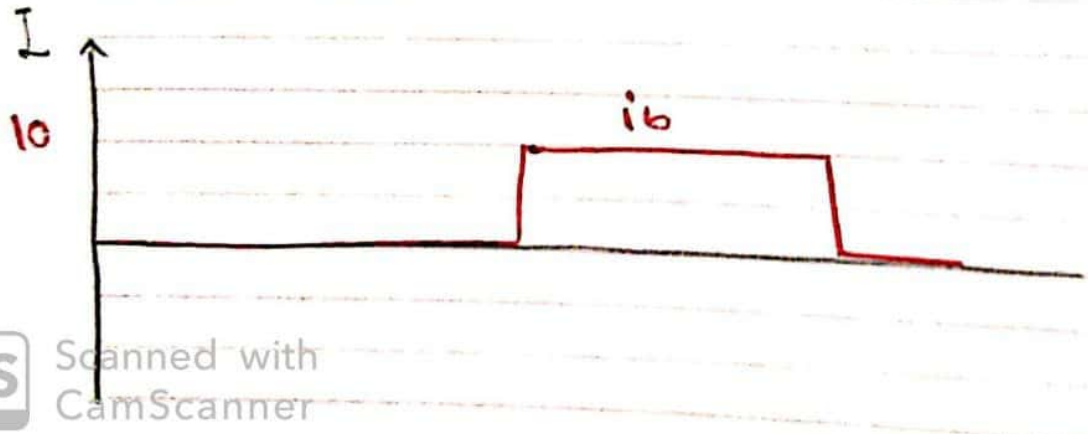
$$V_{T_1,D_1} = \frac{1}{2\pi}\int_{\alpha+\pi}^{2\pi} 220\sqrt{2}\sin\omega t\, d\omega t$$

$$V_{T_2,D_2} = \frac{1}{2\pi}\int_{240}^{360} 220\sqrt{2}\sin\omega t\, d\omega t$$

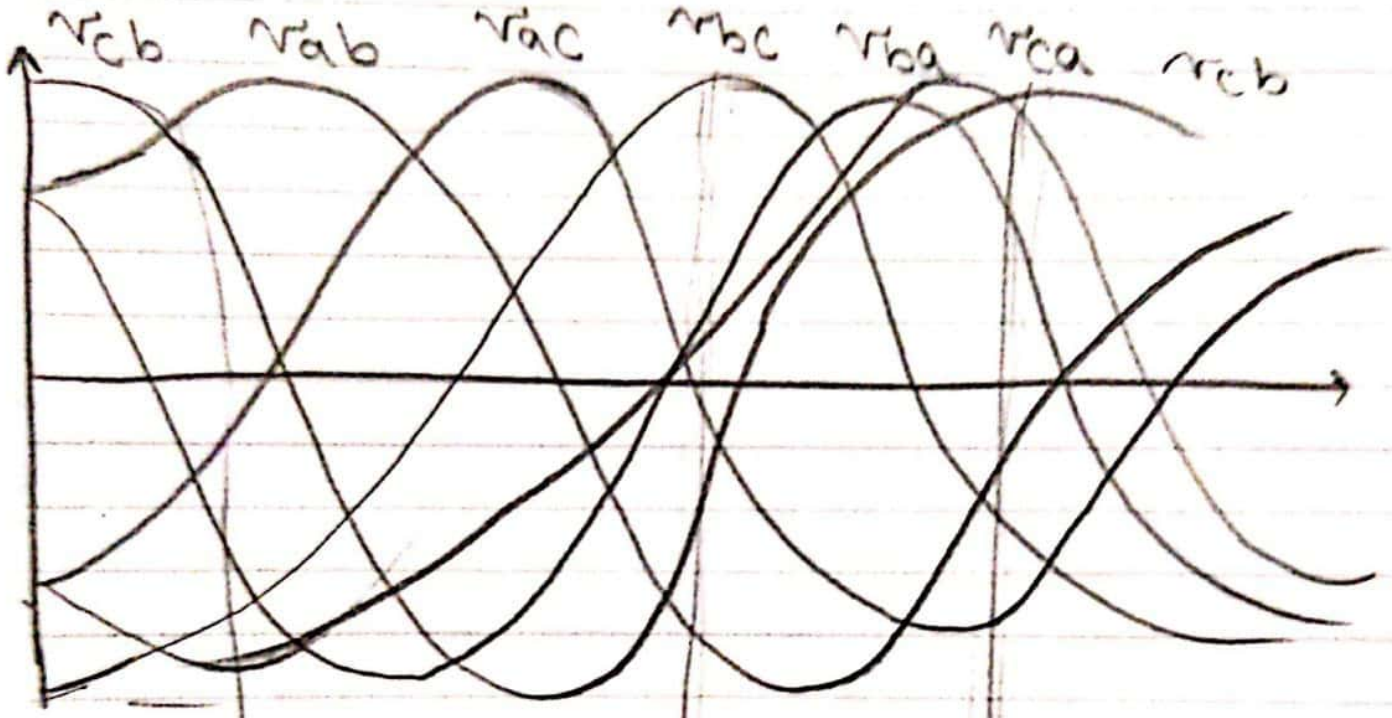
$v_L = 380v$ $f = 50Hz$ $I_d = 5+5 = 10A$ (2

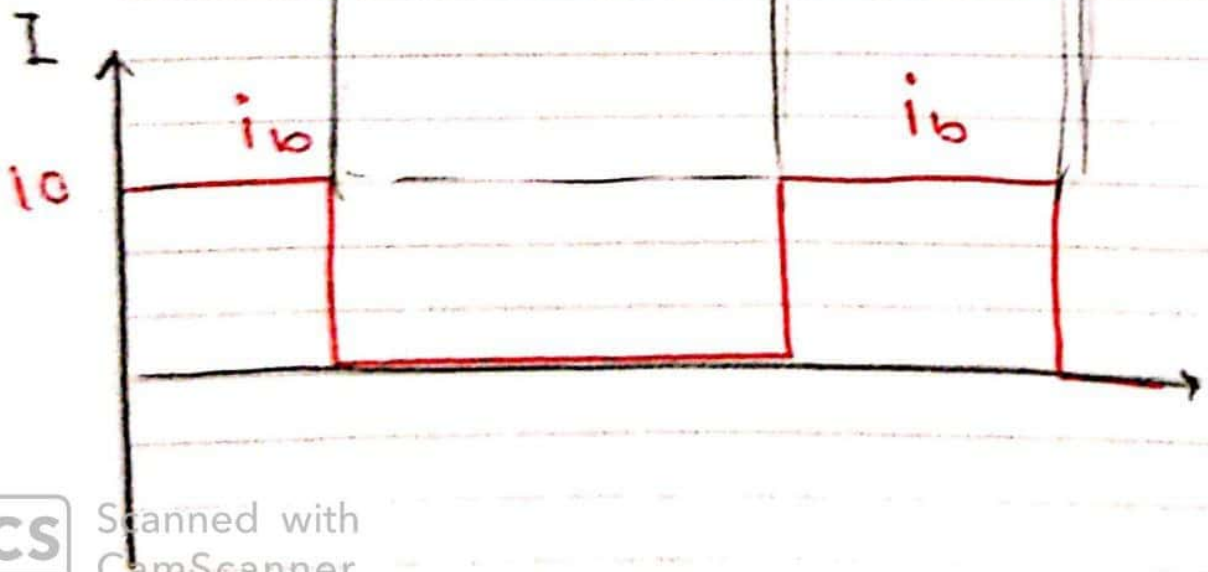
$\alpha = 45^\circ$



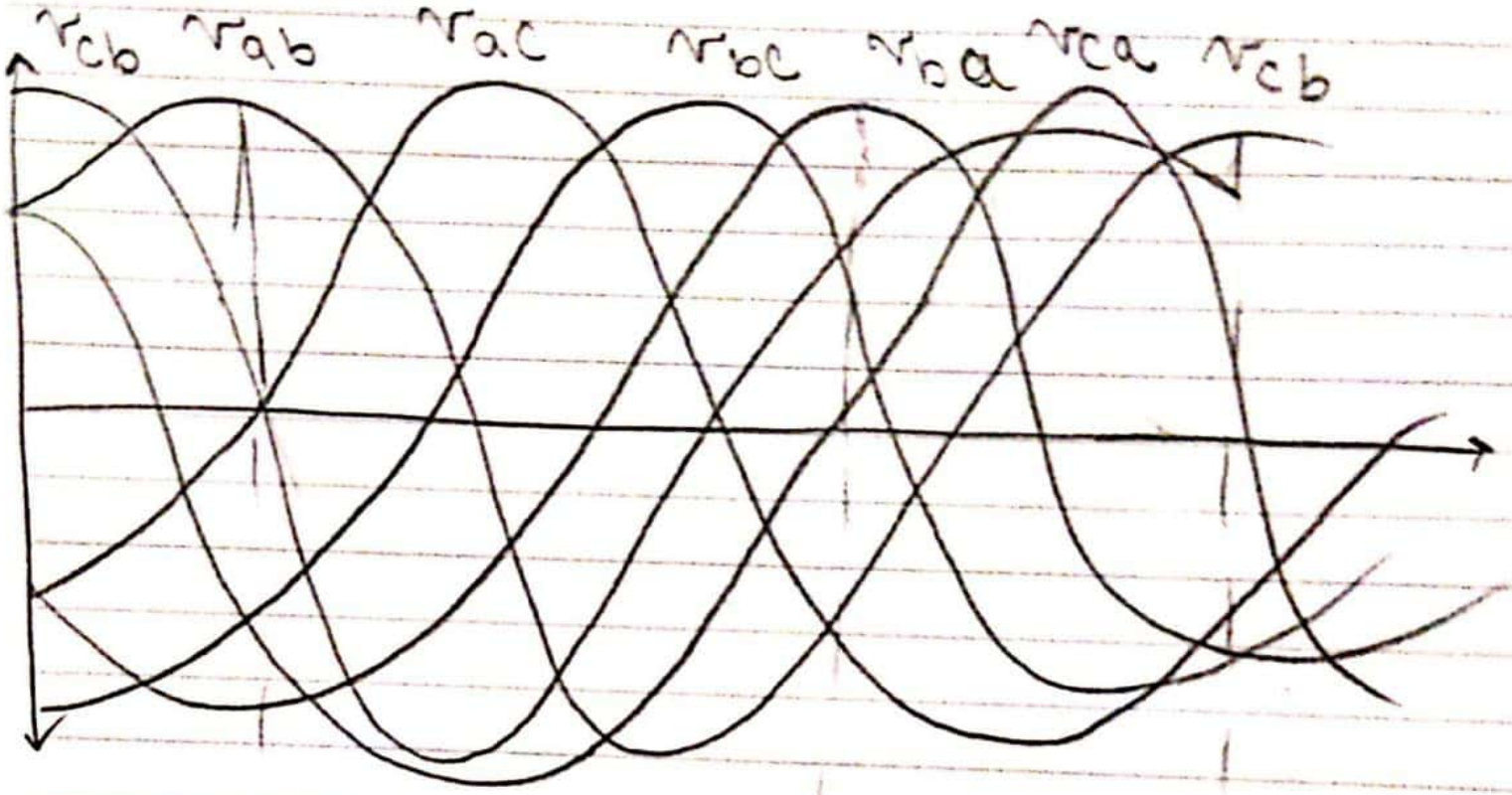


$\alpha = 75°$

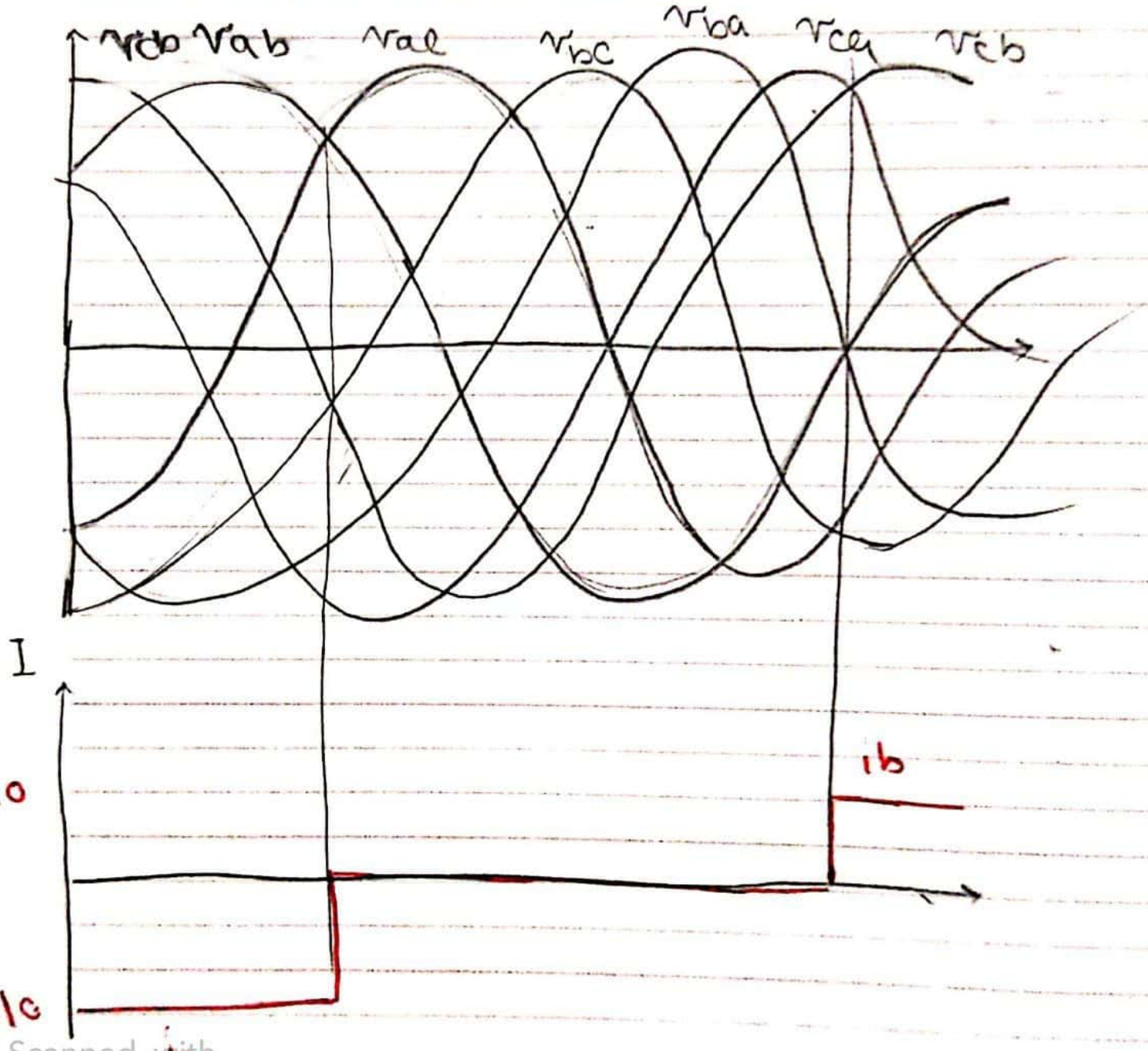




$\alpha = 105^\circ$



$\alpha = 180^\circ$



$\alpha = 45^\circ$ $V_{odc} = \frac{3\sqrt{2}}{\pi} \times 380 \times \cos(45) = 364.17\,V$

$P = V_{odc} I_d = 364.17 \times 10 = 3641.7\,W$

$I_S = 10 \times \frac{\sqrt{2}}{2} = 5\sqrt{2}$

$S = 380 \times \sqrt{2} \times 5\sqrt{3} = 5700$, $Q = \sqrt{(5700)^2 - (3641.7)^2} = 4389.81$

$D = \sqrt{(5700)^2 - (3641.7)^2 - (4389.81)^2} = 1805.45$

$pf = \frac{P}{S} = \frac{3641.7}{5700} = 63.9\%$

$\alpha = 75^\circ$ $V_{odc} = \frac{3\sqrt{2}}{\pi} \times 380 \times \cos(75) = 140.77$

$P = 1347.17\,W$, $I_S = 5\sqrt{2}$, $S = 380 \times \sqrt{2} \times 5\sqrt{2} = 5700\,VA$

$Q = \sqrt{(5700)^2 - (1347.17)^2} = 5543.21$ $D = \sqrt{5700^2 - 1347.17^2 - 5543.21^2} = 484.91$

$pf = \frac{1347.17}{5700} = 23.6\%$

$\alpha = 105^\circ$ $V_{odc} = \frac{3\sqrt{2}}{\pi} \times 380 \times \cos(105) = -134.77$

$P = -1347.17\,W$, $I_S = 5\sqrt{3}$ $S = 5700$

$Q = \sqrt{5700^2 - 1347.17^2} = 5543.21$ $D = 484.91$ $pf = \frac{-1347.17}{5 \times 5700} = 23\%$

$\alpha = 135^\circ$ $V_{odc} = \frac{3\sqrt{2}}{\pi} \times 380 \times \cos(135) = -513$

$P = -10 \times 513 = 5130$, $I_S = 5\sqrt{3}$, $S = 5700$

$Q = \sqrt{5700^2 - 5130^2} = 2481.49$, $D = 11.71$, $pf = \frac{5130}{5700} = 90\%$

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

$I_o = \frac{V_o}{R} = \frac{198}{50} = 3.96 A \rightarrow V_m = 120\sqrt{2} = 170 V$

$\rightarrow 2V_m = PIV = 2 \times 120 \times \sqrt{2} = 240 V$

(۲)

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(۱۱)

(a) $I_o = \frac{V_o - V_{dc}}{R} = \frac{\frac{2V_m}{\pi} - V_{dc}}{R} = \frac{\frac{2 \times 120\sqrt{2}}{\pi} - 48}{2} = 20 A$

$\rightarrow P_{dc} = I_o V_{dc} = 20 \times 48 = 960 W$

(b) $I_{rms} = \sqrt{20^2 + \left(\frac{9.49}{\sqrt{2}}\right)^2 + \left(\frac{14.51}{\sqrt{2}}\right)^2} = 21.02 A$, $P_R = I_{rms}^2 R = 21.02^2 \times 2$

(c) $S = V_{rms} I_{rms} = \frac{120}{\sqrt{2}} \times 21.02 \Rightarrow 1784 VA$, $PF = \frac{P}{S} = \frac{960 + 1259}{1784} = 1$

(d) $\Delta I_o = 2 I_2 = 9.49 = 18.98 A$

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(۲۰)

$C = 33333.3 = 1497 \mu F$

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(۲۵)

(a) $\alpha = 10^\circ$

$i(\omega t) = \frac{V_m}{Z} \sin((\omega t) - \theta) + \left(A e^{-\omega t / \omega \tau}\right)$

$= 10.18 \sin(\omega t - 0.649) + 0.75 e^{-\omega t / 0.785}$ $\rightarrow i(\beta) = 0 \rightarrow \beta = 210^\circ$

$\theta = \arctan\left(\frac{\omega L}{R}\right) = 37^\circ > \alpha \rightarrow V_o = \frac{2V_m}{\pi} \cos\alpha = 201 V$, $I_o = \frac{V_o}{R} = \frac{201}{50}$

(b) $\alpha = 50^\circ \rightarrow \theta = 37^\circ \rightarrow i(\omega t) = 10.18 \sin(\omega t - 0.649) - 7.9 e^{-\omega t / 0.785}$

$\rightarrow i(\beta) = 0 \rightarrow \beta = 249^\circ$ $\rightarrow I_o = \frac{1}{\pi} \int_{\alpha}^{\beta} i(\omega t) \, d(\omega t) = 4.33 A$

$V_o = \frac{2V_m}{\pi} \cos\alpha = \frac{2\sqrt{2}(220)}{\pi} \cos 10 = 189 V$

(۳۰)

$I_o = \frac{100 - 89}{10} = 4.2 A$; $P_{dc} = I_o V_{dc} = (4.2)(100) = 420 W$

$P_{ac} = P_{bridge} = I_o V_o = (4.2)(89) = 373.8 W$

$P_R = P_{dc} - P_{ac} = 420 - 373.8 = 46.2 W \rightarrow \frac{V_r}{V_m} = 0.11$ for $\alpha = 10^\circ$

$V_r = 0.11 \times 2V_m = 0.11 \times 2\sqrt{2} \times 220 = 68.6 V$ $Z_2 = |10 + 2j(377)(0.1)| = 60.2 \Omega$

$I_2 = \frac{V_r}{Z_2} = \frac{68.6}{60.2} = 1.14 A$; $\Delta I_o = 2 I_2 = 2.28$

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(۳۴)

(a) $P_{dc} = 5000W \rightarrow I_o V_{dc} = -5000 \rightarrow I_o = \frac{-5000}{-150} = 33.33A$

$V_o = -150 + 0.4 I_o = -150 + 0.4(33.33) = -136.67V$

$V_o = \frac{2V_m}{\pi}\cos\alpha \rightarrow \alpha = \cos^{-1}\left(\frac{V_o \pi}{2V_m}\right) = \cos^{-1}\left\{\frac{-136.67\pi}{2\sqrt{2}(220)}\right\} = 127^\circ$

(b) $P_{bridge} = I_o(-V_o) = (33.33)(136.67) = 4555.5W$

$\Delta I_o = 0.1 I_o = 0.1(33.33) = 3.33A$; $I_{rr} = \frac{\Delta I_o}{2} = 1.67V$

$L = \frac{166.9}{2(377)} = 0.1194H \rightarrow 200mH$

(c) $\frac{V_r}{V_m} = 1.34 \rightarrow V_r = 0.134(220\sqrt{2}) = 41.72V$

$\sqrt{2} = 1.414$

$Z_r = \frac{V_r}{I_r} = \frac{41.72}{1.67} = 25\Omega$

(۳۵)

(a) $V_o = \frac{2V_m}{\pi} = \frac{2\sqrt{2}(220)}{\pi} = 198A$, $I_o = \frac{V_o}{R} = 19.8A$

(b) $V_6 = \frac{6V_m}{\pi(6^2-1)} = 0.0857V_m = 0.0857\sqrt{2}(220) = 26.67V$, $Z_6 = R = 8\Omega$, $I_6 = \frac{V_6}{Z_6} = \frac{26.67}{8} = 3.33A$

$I_{rms} = \sqrt{19.8^2 + \frac{3.33^2}{2}} = 19.9A$

(c) $I_D = \frac{I_o}{2} = \frac{19.8}{2} = 9.9A$

(d) $I_{D_{rms}} = \frac{19.8}{\sqrt{2}} = 14V$

(e) $I_{S_{rms}} = \frac{19.8\sqrt{2}}{\sqrt{3}} = 16.17A$

(f) $P = I_{o_{rms}}^2 R = (19.8)^2(8) = 3136W$, $S = \sqrt{3}VI = \sqrt{3}(220)(19.8) = 7543.2VA$

$PF = \frac{P}{S} = \frac{3136}{7543.2} = 0.4158$

(۳۶)

(a) $V_o = I_o R = (10)(50) = 500V$, $\alpha = \cos^{-1}\left(\frac{\pi V_o}{2V_m}\right) = 29.5^\circ$

(b) $\frac{V_4}{V_m} = 0.141 \Rightarrow V_4 = 0.141\sqrt{2}(240) = 47.8V$

$\rightarrow V_{12} = 47.8V$

$\rightarrow V_{11} = 47.8V$

(c)