[illegible]

$V_m = 115\ V$

$V_{dc} = \frac{V_m}{\pi} = \frac{115}{\pi} = 36.6\ V$

$I_{dc} = I_{s(ave)} = \frac{V_m}{R\pi} = \frac{V_{dc}}{R} = \frac{36.6}{20} = 1.83\ A$

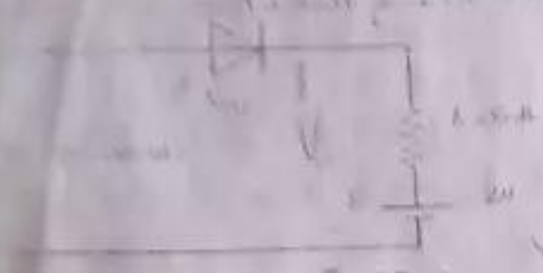
$V_{rms} = \frac{V_m}{2} = \frac{115}{2} = 57.5\ V$

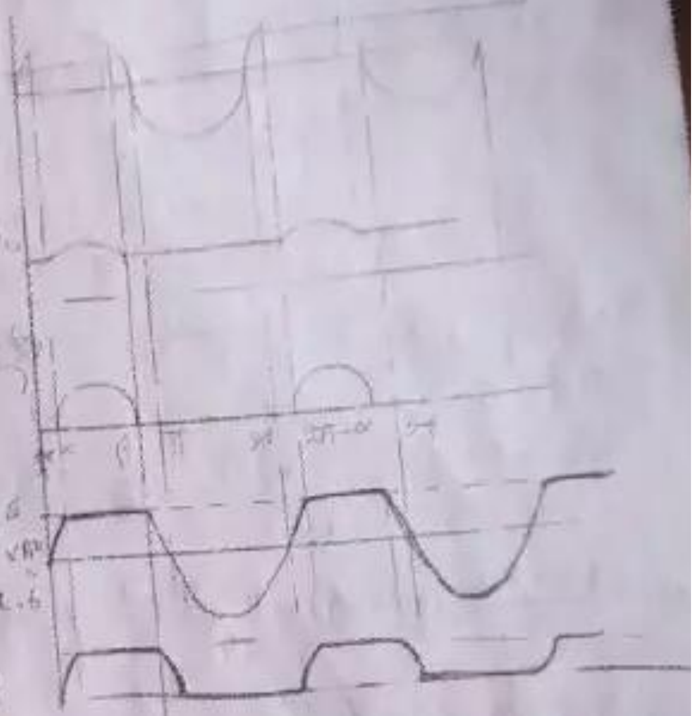
$I_{rms} = \frac{V_m}{2R} = \frac{V_{rms}}{R} = \frac{57.5}{20} = 2.87\ A$

[illegible]

$P_{ac} = V_{rms} * I_{rms}$

$= 57.5 * 2.87 = 165.31\ W$





$E = 24$ V

$R = 5\ \Omega$

$V_s = \frac{V_m}{\sqrt{2}} = \frac{110}{\sqrt{2}} = 77.7$ V

$V_m \sin\alpha = E$

$\sin\alpha = \frac{E}{V_m}$

$\alpha = \sin^{-1}\left(\frac{24}{110}\right) = 0.218$ or 12.6

$\beta = \pi - \alpha = 180 - 12.6 = 167.4$

$\gamma = \beta - \alpha = 167.4 - 12.6 = 154.8$

$I_{dc} = \frac{1}{2\pi R}\left(2V_m\cos\alpha + 2E\alpha - \pi E\right)$

$I_{dc} = \frac{1}{2\pi 5}\left[2*110\cos 12.6 + (2*24*0.218) - (\pi*24)\right]$

$I_{dc} = 4.76$ A

$I_{rms} = \sqrt{\frac{1}{2\pi R^2}\left[\left(\frac{V_m^2}{2} + E^2\right)(\pi - 2\alpha) + \frac{V_m^2}{2}\sin 2\alpha - 4V_mE\cos\alpha\right]}$

$I_{rms} = \sqrt{\frac{1}{2\pi 5^2}\left[\left(\frac{110^2}{2} + 24^2\right)(\pi - 2*0.218) + \frac{110^2}{2}\sin 2(12.6) - 4*110*24\cos(12.6)\right]}$

$$I_{rms} = \sqrt{8.166 \times 10^{-3} (6626 + 27 + 2575.96 - 10305.68)}$$

$I_{rms} = 8.04 \ A$

$P_R = I_{rms}^2 R = 8.04^2 (5) = 323.208 \ W$

$P_{dc} = E \, I_{dc} = 24 * 4.76 = 114.24 \ W$

القدرة المسحوبة من [illegible]

$P_{ac} = P_{dc} + P_R = 323.208 + 114.24$
$= 437.448$ Watt

9.5

* $V_{dc} = ?$ * $V_{rms} = ?$
* $FF = ?$ * $RF = ?$

$V_s = V_p \times \frac{N_2}{N_1} = 120 \times \frac{1}{5} = 24\ V$

$\frac{V_s}{2} = \frac{24}{2} = 12\ V$

$V_m = \frac{V_s}{2} \times \sqrt{2} = 12 \times \sqrt{2} = 16.97\ V$

$V_{dc} = \frac{2V_m}{\pi} = \frac{2 \times 16.97}{\pi} = 10.8\ V$

$I_{dc} = \frac{V_{dc}}{R} = \frac{10.8}{12} = 0.90\ A$

$V_{rms} = \frac{V_m}{\sqrt{2}} = \frac{16.97}{\sqrt{2}} = 11.99\ V$

$I_{rms} = \frac{V_{rms}}{R} = \frac{11.99}{12} = 0.99\ A$

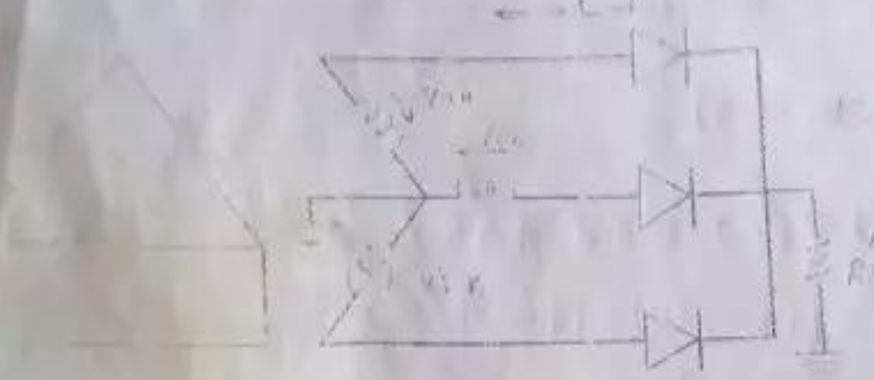
$P_{ac} = V_{rms} \times I_{rms} = 11.99 \times 0.99 = 11.98$ Watt

$P_{dc} = V_{dc} \times I_{dc} = 10.8 \times 0.90 = 9.72$ Watt

$\eta = \frac{9.72}{11.98} \times 100 = 81.1\ \%$

$FF = \frac{11.99}{10.8} = 1.11$ or $111\ \%$

$RF = \sqrt{1.11^2 - 1} = 0.48$ or $48\ \%$



$$V_S = \dots \times \frac{N_2}{N_1} = \frac{\dots}{\dots} = 52\ V$$

$$V_2 = \frac{V_1 N_2}{N_1}$$

$$\frac{V_S \times \sqrt{2}}{\sqrt{3}} = \frac{38 \times \sqrt{2}}{\sqrt{3}} = \dots .02\ V$$

$= 25.65$ Volt

$$\frac{V_{dc}}{R} = \frac{51.3}{10} = 2.56\ \text{Amper}$$

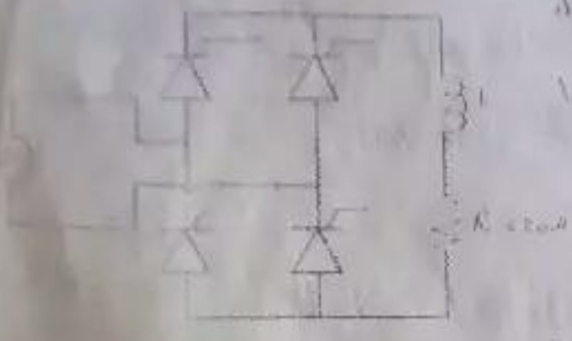
$$V_P = \frac{V_L}{\sqrt{3}}$$

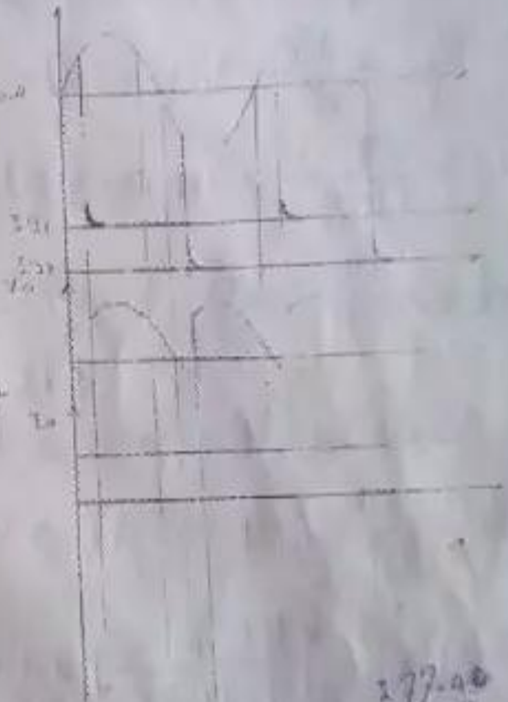
$I_{Ph} = I_L$

توصيلة Δ

$V_P = V_L$

$$I_{Ph} = \frac{I_L}{\sqrt{3}}$$





Sol

$R_L = 20\,\Omega$

$= 1.8 \times \sqrt{2} = 294.15$ Volt

435.57

$\frac{2V_m}{\pi}\cos\alpha$

$I_o R \cdot I_o = I_o^2 R$

$= I_o^2 \times 20$

$= 10\,A$

$R \quad 10 \times 20 = 200\,V$

$200 = \frac{2 \times 435.57}{\pi}$

277.08

$V_o = \frac{2V_m}{\pi}\cos\alpha$

$\cos\alpha$

$= 0.72$

$\alpha = \cos^{-1}(0.72)$

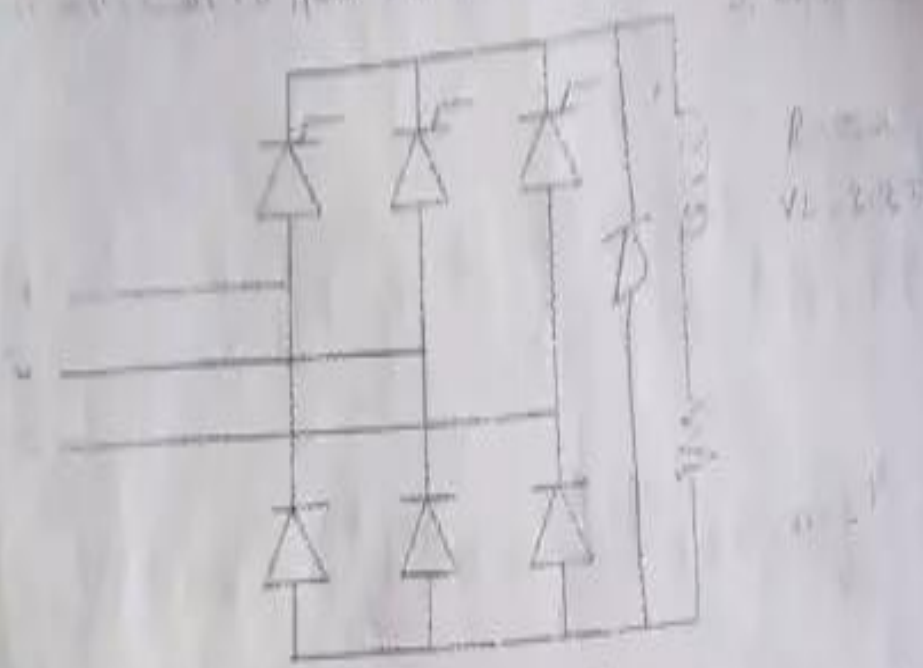
$= 43.87$

$\alpha =$

$V_{omx} = \frac{2V_m}{\pi}\cos\alpha = 277.48$

$I_o = \frac{V_{omx}}{R} = 13.87$ | $P_{dc} = V_{o} I_o = 3848$

[illegible]



$[illegible] = \frac{2 \cdot [illegible] \sqrt{2}}{\sqrt{3}} = 169.83$ V

$V_{ph} = \frac{V_L}{\sqrt{3}}$

$\frac{[illegible]}{2\pi} (1 + \cos\alpha)$

$\frac{[illegible]}{2\pi} = 163.83 (1 + \cos 30°)$

$= 146.44 + 123.63 = 262.07$

مثال

محرك [illegible] 3hp [illegible]

[illegible] 220V [illegible]

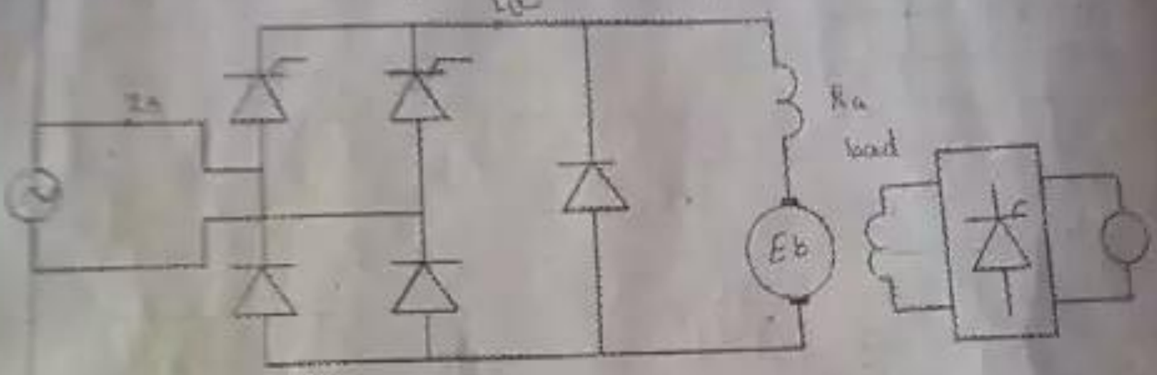
[illegible]

[illegible]

ا) اوجد [illegible] السرعة [illegible]

ب) السرعة عند زاوية اشتعال 60 درجة .

ج) العلم بأن مقاومة ملفات المنتج 2 ohm .



sol

$$V_a = E_a + I_a R_a$$

$$E_a = K\omega$$

$$T = K I_a$$

$$T = \frac{P_o}{\omega}$$

$$P_{out} = 3 \times 746 = 2238 \quad \text{Watt}$$

$$V_a = \frac{V_m}{\pi}(1 + \cos\alpha)$$

$$V_s = 220 \qquad V_m = V_s\sqrt{2} = 220\sqrt{2} = 311.127$$

$$f = 60\ HZ$$

$$\omega = \frac{2\pi N}{60} = \frac{2\pi \times 1500}{60} = 157.07$$

$$T = \frac{P_o}{\omega} = \frac{2238}{157.07} = 14.25 \quad N.m$$

$$T = K I_a \longrightarrow K = \frac{T}{I_a} = \frac{14.25}{12} = 1.187$$

$E_a = K\omega$

$E_a = 1.187 * 157.07 = 186.45 \; V$

$V_a = E_a + I_a R_a$

$= 186.45 + (12 * 0.2) = 188.8 \; V$

$V_a = \frac{V_m}{\pi}(1 + \cos\alpha)$

$188.85 = \frac{311.12}{\pi}(1 + \cos\alpha)$

$1 + \cos\alpha = 1.907$

$\cos\alpha = 0.907$

$\alpha = \cos^{-1}(0.907) = 24.9^\circ$

$\omega = \frac{2\pi N}{60} = \frac{2\pi * 800}{60} = 83.77$ rad/sec

$T = \frac{P_a}{\omega} = \frac{2238}{83.77} = 26.71$

$E_a = K\omega = 1.187 * 83.77 = 99.43 \; V$

$V_a = 99.43 + (12 * 0.2) = 101.83 \; V$

$101.83 = \frac{311.12}{\pi}(1 + \cos\alpha)$

$1 + \cos\alpha = 1.028$

$\cos\alpha = 0.028$

$\alpha = \cos^{-1}(0.028) = 88.39^\circ$

$V_a = \frac{311.12}{\pi}(1 + \cos 180) = 17.36 \; V$

$E_a = V_t - I_a R_a$

$E_a = 12 - (12 \times 0.12) = 10.6$ V

$E_a = k\omega$

$\omega = \dfrac{E_a}{k} = \dfrac{10.6}{1.187} = 8.93$ rad/sec

$\omega = \dfrac{2\pi N}{60}$

$8.93 \times 60 = 2\pi N$

$N = \dfrac{8.93 \times 60}{2\pi} = 85.27$ rpm

← Solution

$f = 3000\ HZ$ $V_d = 2V$

$K = ?$ $T_{on} = ?$ $T_{off} = ?$

$V_{rms} = ?$ $P_s = ?$

$T = \frac{1}{f} = \frac{1}{3000} = 0.000\ sec$

$K(V_S - V_d)^2 = P_o * R = 5000 * 15$

$= \sqrt{75000} = 273.86$

$= 273.86\ V$ $K = \frac{P_o R}{(V_s - V_d)^2} = \frac{5000 * 15}{(300-2)^2} = 0.84$

$K\ V_S = 0.84 * 300 = 253.36\ Volt$

$K = \frac{T_{on}}{T} = \frac{T_{on}}{T_{on} + T_{off}} \Rightarrow K(T_{on} + T_{off}) = T_{on}$

$T_{on} - K\ T_{on} = K\ T_{off}$ $T_{on}(1-K) = K\ T_{off}$

[illegible]

[illegible] = [illegible] V

[illegible] V

[illegible] = 5128 watt

[illegible] = 5[illegible] watt

[illegible] = [illegible] 98.2 %

Q: chopper

$V_s = 300\,V$ $\quad f = 1\,kHz$ $\quad V_D = 2\,V$ $\quad R = 15\,\Omega$

$P_o = 5\,kW$ $\quad k = ?$ $\quad T_{on} = ?$ $\quad T_{off} = ?$

$V_o = ?$ $\quad V_{rms} = ?$ $\quad P_s = ?$ $\quad \eta = ?$

$\Rightarrow T = \frac{1}{f} = \frac{1}{1000} = 0.001\,sec$

$P_o = \frac{k(V_s - V_D)^2}{R} \Rightarrow k(V_s - V_D)^2 = P_o \cdot R \Rightarrow k = \frac{P_o \cdot R}{(V_s - V_D)^2}$

$\Rightarrow k(V_s - V_D)^2 = 5000 \times 15 \Rightarrow k = \frac{5000 \times 15}{(300-2)^2} = 0.84$

$\Rightarrow V_o = k(V_s - V_D)$

$V_o = 0.84(300-2) = 251.67\,V$

$\Rightarrow T_{on} = kT = 0.84 \times 0.001 = 0.00084\,sec$

$\Rightarrow T_{off} = (1-k)T \Rightarrow = T - T_{on} = 0.001 - 0.00084 = 0.00016$

$\Rightarrow V_{rms} = \sqrt{k}\,(V_s - V_D) = \sqrt{0.84} \times (300-2) = 273.12\,V$

$\Rightarrow I_{rms} = \frac{V_{rms}}{R} = \frac{273.12}{15} = 18.21\,A$

$\Rightarrow P_s = \frac{k\,(V_s(V_s - V_D))}{R} = 0.84\,\frac{(300(300-2))}{15} = 5006.4\,W$

$\eta = \frac{P_o}{P_s} = \frac{5000}{5006.4} = 99.87\,\%$