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2 D3 ELIN A.

1) a. $V_{o(dc)} = \frac{2V_m}{\pi}$

Siklus positif.

$$\frac{1}{2\pi}\left(\int_0^{\pi} V_m \sin \omega t \, d(\omega t) + \int_{\pi}^{2\pi} -V_m \sin \omega t \, d(\omega t)\right)$$

$$V_{o(dc)} = \frac{1}{2\pi}\int_0^{\pi} V_m \sin \omega t \, d(\omega t)$$

$$= \frac{V_m}{2\pi}\int_0^{\pi} \sin \omega t \, d(\omega t).$$

$$= \frac{V_m}{2\pi}\left[-\frac{\cos(\omega t)}{\omega}\right]_0^{\pi}, \quad (T = 2\pi).$$

$$= \frac{2V_m}{T}\left[-\frac{\cos(\omega t)}{\omega}\right]_0^{T/2}$$

$$= \frac{2V_m}{\omega T}\left[-\cos(\omega t)\right]_0^{T/2}$$

$$= \frac{2V_m}{\omega T}\left[-\cos\left[\frac{2\pi}{T} \times \frac{T}{2}\right] + \cos(0)\right]$$

$$= \frac{2V_m}{\frac{2\pi}{T} \times T}\cdot\left[-\cos(\pi) + \cos(0)\right]$$

$$= \frac{V_m}{\pi}\left[-\cos(\pi) + \cos(0)\right]$$

$$V_{odc} = \frac{2V_m}{\pi}$$

Siklus negatif.

$$V_{o(dc)} = \frac{1}{2\pi}\int_{\pi}^{2\pi} -V_m \sin \omega t \, d(\omega t). \quad (T_1 < \omega T \leq 2\pi).$$

$$= \frac{V_m}{2\pi}\int_{\pi}^{2\pi} -\sin \omega t \, d(\omega t).$$

$$= \frac{2V_m}{2\pi}\left[-\frac{-(\cos \omega t)}{\omega}\right]_{\pi}^{2\pi}. \quad (T = 2\pi).$$

$$= \frac{2V_m}{T}\left[\cos(\omega t)\right]_{T/2}^{T}, \quad (\omega = \frac{2\pi}{T}).$$

$$V_{o(dc)} = \frac{2V_m}{\pi}\left[\cos\left(\frac{2\pi}{T}\times\frac{T}{2}\right)\right] + \left[\cos\left(\frac{2\pi}{T}\times T\right)\right].$$

$$V_{o(dc)} = \frac{2V_m}{\pi}\left[\cos\pi + \cos 2\pi\right]$$

$$= \frac{2V_m}{\pi}\left[1 + (-1)\right]$$

$$= 0.$$

1) B. $V_{o(rms)} = V_{s(rms)}$.

$$V_{o(rms)} = \sqrt{\frac{1}{2\pi}\left(\int_0^{\pi}(V_m.\sin\omega t)^2\, d(\omega t) + \int_{\pi}^{2\pi}(-V_m.\sin\omega t)^2\, d(\omega t)\right.}$$

Maka

$$V_{o(rms)} = \sqrt{\frac{1}{2\pi}\left(\int_0^{\pi}(V_m.\sin\omega t)^2\, d(\omega t)\right.}$$

Menghitung Rms karena nilai dari Rms akan selalu sama untuk setiap periode $0 < \omega t < \pi$ sampai $\pi < \omega t \leq 2\pi$

$$V_{o(rms)} = \sqrt{\frac{1}{2\pi}\int_0^{\pi} V^2(1)\, dt}$$

$$= \sqrt{\frac{1}{2\pi}\int_0^{\pi}(V_m.\sin\omega t)^2\, d(\omega t)}$$

$$= \frac{1}{\frac{T}{2}}\int_0^{T/2}(V_m.\sin.\omega t)^2\, d(\omega t).\ (T = 2\pi)$$

$$= \frac{2}{T}\int_0^{T/2} V_m^2.\sin^2\omega t\, d(\omega t)$$

$$= \frac{2V_m}{T}\int_0^{T/2}\left[\frac{-\cos(2\omega T)}{2}\right] d(\omega t).$$

$$= \frac{V_m}{T}\left[\omega t - \frac{\sin(2\omega t)}{2\omega}\right]_0^{T/2}$$

$$= \frac{V_m}{T}\left[\frac{T}{2} - \frac{\sin\left(2\cdot\frac{2\pi}{T}\times T\right)}{2\omega} - 0 + \frac{\sin(0)}{2\omega}\right]$$

$$= \frac{V_m^2}{T}\times\frac{T}{2}$$

$$= \frac{V_m}{\sqrt{2}} \quad \left(V_{s(rms)} = \frac{V_m}{\sqrt{2}}\right.$$

$$V_{o(rms)} = V_{s(rms)}$$

3. Diketahui :

$V_{ac\ (rms)} = 220V$

frequency: 50 Hz.

Trafo step down: 6 : 1

a) Dikat :

$R = 100$ ohm

$F_f = ?$ $\quad \Delta V_o = ?$

$R_f = ?$

Maka.

$\frac{N_p}{N_s} = \frac{V_p}{V_s}$

$\frac{6}{1} = \frac{220}{V_s}$

$V_s = 36,6\ V.$

$V_{s(rms)\ max} = 36,6 \times \sqrt{2}$

$= \sqrt{1,7}$

$V_{o(dc)} = 0,636 \times V_s$

$= 0,636 \times \sqrt{1,7}$

$= 32,8V.$

$V_{o(rms)} = V_{s(rms)}$

$V_{o(rms)} = 36,6V.$

$V_{ac} = \sqrt{(V_{(rms)})^2 - (V_{o(dc)})^2}$

$= \sqrt{(36,6)^2 - (32,8)^2}$

$= 16,2\ V.$

Mata

$f_f = \frac{V_{o(rms)}}{V_{o(dc)}} = \frac{36,6}{32,8} = 1,1$

$R_f = \frac{V_{ac}}{V_{dc}} = \frac{16,2}{32,8} = 0,49$

$\Delta V_o = 2\sqrt{2} \times V_{ac}$

$= 2\sqrt{2} \times 16,2$

$= 45,8\ V$

$I_{o(dc)} = \frac{V_{o(dc)}}{R}$

$= \frac{32,8}{100} = 0,328\ A.$

$P_{o(dc)} = V_{o(dc)} \times I_{o(dc)}$

$= 32,8 \times 0,328$

$= 10,75\ WATT$

$P_f = \frac{V_{o(rms)}}{V_{s(rms)}} = \frac{36,6}{36,6} = 1$

$I_{o\ (rms)} = \frac{I_{o(dc)}}{(\sqrt{2} \times 0,636)} = \frac{0,328}{0,899} = 0,364\ A$

$P_{o(rms)} = V_{o(rms)} \times I_{o(rms)}$

$= 36,6 \times 0,364 = 13,3\ watt$

$\eta_{fisiensi} = \frac{P_{o(dc)}}{P_{o(ac)}} = \frac{10,75}{13,3}$

$= 0,8 = 80\ \%.$

3) B. Dipasang kapasitor filter sebesar kesso 0,F

maka

$$\Delta V_o = \frac{V_{cmax)}}{2.f.R.C}$$

$$= \frac{V_{s(rms)} \times \sqrt{2}}{2.50.100.10^{-3}}$$

$$= 5,176\ V.$$

$$V_{o(dc)} = V_m - \left[\frac{\Delta V_o}{2}\right]$$

$$= 86,6 \times \sqrt{2} - \frac{5,176}{2}$$

$$= 99,1\ V$$

$$V_{ac} : \left[\frac{\Delta V_o}{2\sqrt{2}}\right] = \left[\frac{5,176}{2}\right] : 2,58 V.$$

$$ff = \frac{V_{(rms)}}{V_{dc}} =$$

$$V_{s(rms)} : \sqrt{V_{ac}^2 + V_{dc}^2}$$

$$= \sqrt{(2,58)^2 + (99,1)^2}$$

$$= 99,1\ V$$

$$ff = \frac{V_{(rms)}}{V_{dc}} = \frac{99,1}{99,1} = 1$$

$$Rf = \frac{V_{ac}}{V_{dc}} = \frac{2,58}{99,1} = 0,052$$

3) C. jika ΔV_o 0,5%.

$$\Delta V_o = 0,5\% \times V_{s\,cmax)}$$

$$= 0,5\% \times 51,7$$

$$= 0,25\ V$$

$$\Delta V_o = \frac{V_{max}}{2f.R.C}$$

$$0,25 = \frac{51,7}{100.100.C}$$

$$0,25 \times (100.C) = 51,7$$

$$2500\,C = 51,7$$

$$C = 0,02\ F$$

$$V_{dc} = V_m - \frac{\Delta V_o}{2}$$

$$= 51,7 - \frac{0,25}{2}$$

$$= 51,57\ V$$

$$V_{ac} = \Delta V_o \times (2\sqrt{2})^{-1}$$

$$= 0,25 \times (2\sqrt{2})^{-1} = 0,088\ V.$$

$$V_{rms} = \sqrt{V_{ac}^2 + V_{dc}^2}$$

$$= 51,57\ V.$$

$$ff = 1$$

$$Rf = 0,001$$

3) D. jika Ripple factor = Standart Internasional. maka.

$RF = \leq 1\%$

Sehingga.

$RF = 1\% \times 32.8$

$= 0,328\ V.$

$RF = \frac{Vac}{Vdc}$

$0,328 = \frac{Vac}{32,8}$

$Vac = 10,75\ V.$

$\Delta Vo = 2\sqrt{2} \times 10,75$

$= 30,4\ V.$

$\Delta Vo = \frac{Vm}{2fRC}$

$30,9 = \frac{51,7}{2 \cdot 50 \cdot 100 \cdot C.}$

$30,9 \cdot 2 \cdot 5.100)C = 51,7$

$309000\ C = 51,7$

$C = 0,17\ mF.$

$Vdc = Vm - \frac{\Delta Vo}{2}$

$= 51,7 - \frac{309}{2}$

$= 36,5\ V.$

$Vrms = \sqrt{Vdc^2 + Vac^2}$

$= \sqrt{10,75^2 + 36,5^2}$

$= 32,2\ V.$

$Ff = 0,8$

$RF = 0,3$

* jika $RF = 0,005\ Vmax.$

$RF = 0,005 \times Vm$

$= 0,005 \times 547$

$= 0,25$

$RF = \frac{Vac}{Vdc}$

$0,25 = \frac{Vac.}{32,8}$

$Vac. = 8,2\ V.$

$\Delta Vo = 2\sqrt{2} \times 8,2$

$= 23,1\ V$

$\Delta Vo = \frac{Vm}{2fRC}$

$23,1 = \frac{51,7}{2 \cdot 50 \cdot 100\ C.}$

$C = 0,22\ mF$

$Vdc = Vm - \frac{\Delta Vo}{2}$

$= 51,7 - \frac{23,1}{2}$

$= 40,1$

$Vrms = \sqrt{Vac^2 + Vdc^2}$

$= \sqrt{(8,2)^2 + 40,1^2}$

$= 40,9\ V.$

$FF = 0,1$

$RF = \frac{Vrms}{Vdc}$

$= \frac{40,9}{40,1}$

$= 1,019$

3) E). Dari praktikum yang telah dilaksanakan.

$V_{dc} = 33,V$

$V_{dc(rms)} = 36,67\ V.$

$V_{sumber} = 311,12\ V.$

$I_{dc(rms)} = 0,366$

$I_{dc} = 0,33$

Maka.

$$V_{ac} = \sqrt{(V_{o(dc)})^2 + (V_{o(rms)})^2}$$
$$= \sqrt{36,67^2 - 33^2}$$
$$= 15,9$$

$$FF = \frac{V_{rms}}{V_{o\,dc}}$$
$$= \frac{36,67}{33.} = 1,1$$

$$RF = \frac{V_{ac}}{V_{dc}}$$
$$= \frac{15,9}{33.} = 0,48$$

$$\Delta V_o = 2\sqrt{2} \times V_{dc}.$$
$$= 99,9V.$$

$$P_{dc} = V_{dc} \times I_{dc}$$
$$= 33 \times 0,33$$
$$= 10,89\ Watt.$$

$$P_o = V_o \times I_o$$
$$= 36,67 \times 0,366.$$
$$= 13,421\ Watt.$$

$$\eta = \frac{P_{o(dc)}}{P_{(ac)}} \times 100\%$$
$$= 81.\ \%.$$

* Untuk $R = 100$ Ohm.

$V_{dc} = 47,9\ V$

$V_{rms} = 48,5\ V.$

$I = 1,71$

$V_s = 51,86V.$

$$\Delta V_o = \frac{V_s}{2fRC}$$
$$= \frac{56,95}{2fRC}$$
$$= 5,695\ V.$$

$$V_{dc} = V_m - \frac{\Delta V_o}{2}$$
$$= 56,95 - \frac{5,695}{2.}$$
$$= 54,1\ V$$

$$V_{ac} = \frac{\Delta V_o}{2\sqrt{2}}$$
$$= \frac{5,695}{2\sqrt{2}} = 2,01V.$$

$$V_{rms} = \sqrt{(54,1)^2 + (2,01)^2}$$
$$= 54,1\ V.$$

$FF = 1,01$

$RF = 0,692$

3). E. Dengan kapasitor filter. dan R.

Diketahui

$V_{s(max)}$: 56,97V.

V_{dc} : 50.01V

V_{rms} : $V_{o(rms)}$: 50,07V.

~~$V_{s(max)}$~~ :

$\Delta V_o = \frac{V_{s(max)}}{2fRC}$

$= \frac{51,96}{2.50.100.0,02}$

$= 0,289.$

$V_{dc} : \frac{\Delta V_o}{2\sqrt{2}} = \frac{0,289}{2\sqrt{2}}$

$= 0,10V.$

$FF = \frac{V_{o(rms)}}{V_{o(dc)}}$

$= \frac{50,07}{50,01}$

$= 1,001$

$RF = \frac{V_{ac}}{V_{dc}} . 0,0020.$

Data dari percobaan.

V_o dc = 42,55V.

V_o (rms) : 93,36V.

$\Delta V_o = \frac{V_{s\,max}}{2fRC}$

$= \frac{51,96}{2.50.100.0168\times10^{-3}}$

$\Delta V_o = 30,93V.$

$V_{dc} = \frac{\Delta V_o}{2\sqrt{2}}$

$= \frac{30,93}{2\sqrt{2}}$

$= 10,960V.$

$FF : \frac{V_{rms}}{V_{dc}} = \frac{93,6}{42,5} = 1019$

$RF = \frac{V_{ac}}{V_{dc}} = \frac{10,918}{42,55} = 0,259.$