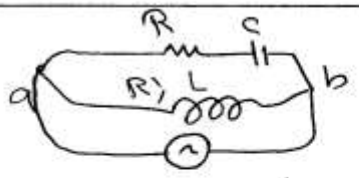
I

أولاً



$R = 40\ \Omega$ ، $C = \frac{1}{4000\pi}$ F : في

$R' = 40\ \Omega$ ، $\cos\varphi_2 = \frac{1}{\sqrt{2}}$: في

في الدارة Z ①

$$Z_1 = \sqrt{R^2 + X_c^2}$$

$$X_c = \frac{1}{\omega C} = \frac{1}{100\pi \frac{1}{4000\pi}} = 40\ \Omega$$

$$Z_1 = \sqrt{(40)^2 + (40)^2} = 40\sqrt{2}\ \Omega$$

$$Z_2 = \sqrt{R'^2 + X_L^2}\ ,\ \cos\varphi_2 = \frac{R'}{Z_2}$$

$$Z_2 = \frac{R'}{\cos\varphi_2} = 40\sqrt{2}\ \Omega$$

② $I_{eff_1} = \frac{U_{eff}}{Z_1} = \frac{200}{40\sqrt{2}} = \frac{5}{\sqrt{2}}$ A

$$I_{eff_2} = \frac{U_{eff}}{Z_2} = \frac{200}{40\sqrt{2}} = \frac{5}{\sqrt{2}}\ A$$

$$i = I_{max} \cos(100\pi t + \varphi)$$

$$i_1 = \frac{5}{\sqrt{2}}\sqrt{2}\cos\left(100\pi t + \frac{\pi}{4}\right)$$

$$\left(\cos\varphi_1 = \frac{R}{Z_1} = \frac{40}{40\sqrt{2}} = \frac{1}{\sqrt{2}},\ \varphi_1 = \frac{\pi}{4}\ rad\right)$$

$$i_2 = \frac{5}{\sqrt{2}}\sqrt{2}\cos\left(100\pi t - \frac{\pi}{4}\right)$$

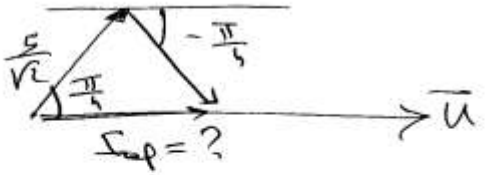
③ $P_{av_1} = U_{eff} \cdot I_{eff_1} \cos\varphi_1$

$$= 200 \cdot \frac{5}{\sqrt{2}} \frac{1}{\sqrt{2}} = 500\ watt$$

$P_{av_2} = 500$ watt

ومنه $P_{av} = 1000$ W

④



$$\vec{I_{eff}} = \vec{I_{eff_1}} + \vec{I_{eff_2}}$$

$$I_{eff}^2 = \left(\frac{5}{\sqrt{2}}\right)^2 + \left(\frac{5}{\sqrt{2}}\right)^2$$

$$I_{eff} = 5\ A$$

⑤ في حالة الرنين

$$Z = Z$$

بعد صل وضع الـ C

$$\sqrt{R'^2 + X_L^2} = \sqrt{R'^2 + (X_L - X_C)^2}$$

$$X_L^2 = (X_L - X_C)^2$$

$$X_L = X_L - X_C \Rightarrow X_C = 0$$

$C \longrightarrow \infty$ وشوف

$$X_L = -(X_L - X_C) \Rightarrow X_C = 2X_L$$

ومن ①:

$$40\sqrt{2} = \sqrt{(40)^2 + X_L^2}$$

$$X_L = 40\ \Omega$$

$$X_C = 80\ \Omega$$

$$C = \frac{1}{8000\pi}\ F$$

حساب I'_{eff} الجديدة في الدارة

$\varphi_2 = +\frac{\pi}{4}$

$X_C > X_L$

ومنه $I_{eff} = \frac{5}{\sqrt{2}} + \frac{5}{\sqrt{2}} = \frac{10}{\sqrt{2}}$ A

(2)

ثانياً

1) عندما $\varphi = 0$ بين u و i فإن الدارة حالة تجاوب كهربائي

$Z = R$

$Z = \frac{U_{eff}}{I_{eff}} = \frac{100}{5} = 20\ \Omega$

$R = 20\ \Omega$

$X_L = X_C \Rightarrow \frac{1}{\pi} \cdot 100\pi = \frac{1}{100\pi C}$

$C = \frac{1}{10000\pi}\ F$

2) $P_{av} = R I_{eff}^2$

$= 20(5)^2 = 500\ W$

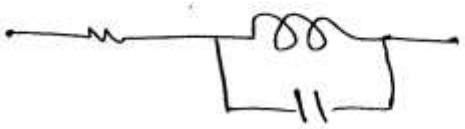
3) $U_{eff_L} = X_L I_{eff} = 100 \cdot 5 = 500\ V$

$u = U_{max} \cos(100\pi t + \varphi)$

$U_{eff} = X_L I_{eff} = 100 \cdot 5 = 500\ V$

$u = 500\sqrt{2} \cos(100\pi t + \frac{\pi}{2})$

4)

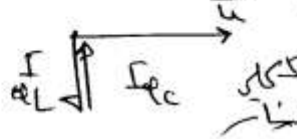


$I_{eff_L} = \frac{U_{eff}}{X_L}$

$I_{eff_C} = \frac{U_{eff}}{X_C}$

$X_L = X_C \Rightarrow I_{eff_L} = I_{eff_C}$

$\vec{I_{eff}} = \vec{I_{eff_L}} + \vec{I_{eff_C}}$



$I_{eff} = I_{eff_L} - I_{eff_C} = 0$ بالإضافة

ثالثاً

1) $Q' = S_1 v_1 = S_2 v_2$

$\pi r_1^2 v_1 = \pi r_2^2 v_2$

$(5 \times 10^{-2})^2 \cdot 4 = (10 \times 10^{-2})^2 v_2 \Rightarrow v_2 = 1\ m s^{-1}$

$Q' = S_1 v_1 = \pi \cdot 25 \times 10^{-4} \cdot 4$

$= \pi \times 10^{-2}\ m^3 s^{-1}$

$Q = \rho Q' = 1000 \cdot \pi \cdot 10^{-2}$

$= 10\pi\ Kg s^{-1}$

2) $P_1 - P_2 = \frac{1}{2}\rho(v_2^2 - v_1^2) + \rho g(z_2 - z_1)$

$= \frac{1}{2} 10^3 (1 - 16) + 5000$

$= -2{,}5 \times 10^3\ Pa$

3) $W = \Delta E_K + \Delta E_p$

$\frac{W}{V} = \frac{\Delta E_K}{V} + \frac{\Delta E_p}{V}$

$= \frac{1}{2}\rho(v_2^2 - v_1^2) + \rho g(z_2 - z_1)$

$= P_1 - P_2 = -2{,}5 \times 10^3$

$W = -2{,}5 \times 10^3 \times 10^{-1}$

$= -2{,}5 \times 10^2\ J$

4) $P_1 - P_2 = \rho g(z_2 - z_1)$

$= 10^3 \cdot 10 \cdot \frac{1}{2} = 5 \times 10^3\ Pa$

$(v_1 = v_2 = 0$ ؛ أفقي$)$

(3)

أولاً:

$\ell = 1\,m$

$m = 10^{-2}\,Kg$

$f = 50\,Hz$, $F_T = 4\,N$

$\mu = \frac{m}{\ell} = \frac{10^{-2}}{1} = 10^{-2}\,Kg\,m^{-1}$ ①

$v = \sqrt{\frac{F_T}{\mu}} = \sqrt{\frac{4}{10^{-2}}} = 20\,ms^{-1}$

$v = \lambda f \Rightarrow \lambda = \frac{20}{50} = 0,4\,m$

عدد الأطوال الموجية $= \frac{\ell}{\lambda} = \frac{1}{0,4} = 2,5$ ②

③

$y_{max/n} = 2y_{max} \left| \sin 2\frac{\pi}{\lambda} x \right|$

$= 2 \cdot 1 \times 10^{-2} \sin 2\frac{\pi}{0,4}\, 0,2$

$= 0$ (عقدة)

$\mu = \rho S$ ③

$\rho = \frac{10^{-2}}{10^{-5}} = 10^{3}\,Kg\,m^{-1}$

④

$v_{max} = \omega_0 y_{max}$

$= 2\pi \cdot 50 \left(2 \times 1 \times 10^{-2}\right)$

$= 4\pi\ ms^{-1}$

⑤

$K\sqrt{F_T} = K'\sqrt{F_T'}$

$K = 25 \times 2 = 5$ حيث

$5\sqrt{4} = 1\sqrt{F_T'}$

$F_T' = 100\,N$

مذاكرة : مسائل / ميكانيك سوائل /

[1]

$B = W - W'$

① $W' = 5,4 - 2,7 = 2,7\,N$

② $B = \rho g V$

$V = \frac{2,7}{10^3 \cdot 10} = 2,7 \times 10^{-4}\,m^3$

③ وزن المادة $W = \rho g V'$

$V' = \frac{5,4}{2700 \cdot 10} = 2 \times 10^{-4}\,m^3$

تجويف $V'' = 2,7 \times 10^{-4} - 2 \times 10^{-4}$

$= 0,7 \times 10^{-4}\,m^3$

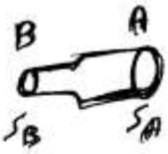
④ $B = \rho g V$

$2,16 = \rho \cdot 10 \cdot 2,7 \times 10^{-4}$

$\rho = 800\,kg\,m^{-3}$

⑤ $V = 2,7 \times 10^{-4}\,m^3$

[2]



$Q' = 0,08\,m^3 s^{-1}$

$S_A = 0,04\,m^2$

$v_B = 4\,ms^{-1}$

① $Q' = S_A v_A$

$v_A = \frac{8 \times 10^{-2}}{4 \times 10^{-2}} = 2\,ms^{-1}$

$S_B = \frac{8 \times 10^{-2}}{4} = 2 \times 10^{-2}\,m^2$

② $W = \Delta E_K$

$\frac{W}{V} = \frac{\Delta E_K}{V} = \frac{1}{2}\rho(v_2^2 - v_1^2)$

$\frac{W}{0,1} = \frac{1}{2} 10^3 (16 - 4)$

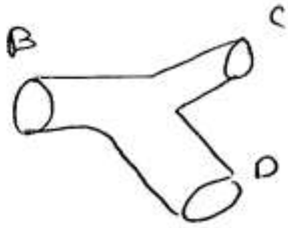
$W = +600\,J$

③ $P_1 - P_2 = \frac{1}{2}\rho(v_2^2 - v_1^2)$

$= \frac{1}{2} \times 10^3 (16 - 4)$

$= +6000\,Pa$

④



$Q'_C = \frac{1}{9} Q'_D$

$Q'_B = Q'_C + Q'_D$

$= Q'_C + 9\,Q'_C$

$Q'_B = 10\,Q'_C$

$8 \times 10^{-2} = 10\,Q'_C \Rightarrow Q'_C = 8 \times 10^{-3}$

$Q'_C = S_C \cdot v_C \Rightarrow v_C = \frac{8 \times 10^{-3}}{10^{-2}}$

$= 0,8\,ms^{-1}$

$Q'_C = \frac{1}{9} S_D v_D$

$8 \times 10^{-3} = \frac{1}{9} \times S_D \cdot 3$

$S_D = 24 \times 10^{-3}\,m^2$

[3]

$Q' = S v_1 = 10 \times 10^{-4} \cdot 20$

$Q' = 2 \times 10^{-2}\,m^3 s^{-1}$

$Q' = S_2 v_2 \Rightarrow v_2 = \frac{1}{2} v_1 = 10\,ms^{-1}$

$P_1 + \frac{1}{2}\rho v_1^2 + \rho g z_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g z_2$

$z_1 - z_2 = h$

$10^5 + \frac{1}{2} \times 10^3 \cdot 400 + 1000 \cdot 10 (10) = P_2 + \frac{1}{2} \times 10^3 \cdot 10^2$

$P_2 = 350 \times 10^3\,Pa$