

ملك غازي لتفوق الامتحانية
نموذج (A)

$$k = \omega_0^2 m$$

$$\omega_0 = \frac{2\pi}{T_0} = \frac{2\pi}{1} = 2\pi \text{ rad.s}^{-1}$$

$$\Rightarrow k = (2\pi)^2 \times 100 \times 10^{-3} = 400 \times 0.1 = 4 \text{ N.m}^{-1}$$

$$T_0 = 2\pi \sqrt{\frac{I_0}{mgd}} \quad (2)$$

$$I_{010} = I_{01c} + md^2 \quad \text{هاينز}$$

$$= \frac{1}{12} mL^2 + m \left(\frac{L}{2}\right)^2$$

$$= \frac{1}{12} mL^2 + \frac{1}{4} mL^2$$

$$= \frac{4}{12} mL^2 = \frac{1}{3} mL^2$$

$$\Rightarrow T_0 = 2\pi \sqrt{\frac{\frac{1}{3} mL^2}{mg \frac{L}{2}}} = 2\pi \sqrt{\frac{2L}{3g}}$$

$$T_0 = 2\pi \sqrt{\frac{2(1.5)}{3(10)}} = 2 \text{ s}$$

$$L = \frac{L_0}{\delta} \quad \dots (*) \quad (3)$$

$$\delta = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{1}{\sqrt{1 - \frac{9}{100} \frac{c^2}{c^2}}} = \frac{1}{\sqrt{1 - \frac{9}{100}}}$$

$$\delta = \frac{1}{\sqrt{\frac{1}{10}}} = \sqrt{10}$$

$$L = \frac{4\pi}{\pi} = 4 \text{ m}$$

نفوضه بـ (*):

تعبير الجوة

(4) c

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

$$\omega_0' = \frac{1}{\sqrt{LC'}} = \frac{1}{\sqrt{L \times 3C}} = \frac{1}{\sqrt{3} \sqrt{LC}}$$

$$\omega_0' = \frac{\omega_0}{\sqrt{3}}$$

(1) ص 22 من الكتابات متفق (أجرب)

+ الجزء الثاني غير من ص 23 من الكتاب

+ العوامل المؤثرة في الدور ص 24

(2) ص 111 + 112 من الكتاب

(3) منتصف ص 128 متفق ص 129 مع

ذرات العوامل المؤثرة في الدور

(1) ص 162 من الكتاب

(2) منتصف ص 172 + بايت ص 173

(3) ص 211 (تمت الجواب)

(4) المسألة الأولى:

$$T_0 = 2\pi \sqrt{\frac{I_0}{mgd}} \quad (1)$$

$$I_0 = I_0 + I_{01m_1} + I_{01m_2}$$

$$= 0 + m_1 r_1^2 + m_2 r_2^2$$

$$= (0.4)(0.2)^2 + (0.6)(0.8)^2$$

$$= 16 \times 10^{-3} + 384 \times 10^{-3}$$

$$= 400 \times 10^{-3} = 0.4 \text{ Kg.m}^2$$

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المسألة الثانية: (1)

التيارات باتجاهين متعاكسين:

$$B_t = B_1 + B_2$$

$$5 \times 10^{-5} = 2 \times 10^{-7} \frac{I_1}{d_1} + 2 \times 10^{-7} \frac{I_2}{d_2}$$

$$5 \times 10^{-5} = \frac{2 \times 10^{-7}}{4 \times 10^{-2}} (I_1 + I_2)$$

$$I_1 + I_2 = 10 \text{ A} \quad (1)$$

التيارات باتجاهين لجهة:

$$B_t = B_2 - B_1$$

$$3 \times 10^{-5} = 2 \times 10^{-7} \frac{I_2}{d_2} - 2 \times 10^{-7} \frac{I_1}{d_1}$$

$$3 \times 10^{-5} = \frac{2 \times 10^{-7}}{4 \times 10^{-2}} (I_2 - I_1)$$

$$I_2 - I_1 = 6 \text{ A} \quad (2)$$

بجمع المعادلتين (1) و (2) نجد أنه:

$$2I_2 = 16 \Rightarrow I_2 = \frac{16}{2} = 8 \text{ A}$$

$$I_1 = 10 - I_2 = 10 - 8 \quad (1) \Rightarrow I_1 = 2 \text{ A}$$

$$I_1 = 2 \text{ A}$$

(2) تتحرك الحثين في لفتين لفتية تكون

تساويًا: $B_1 = B_2$ متعاكسين بالجهة

$$2 \times 10^{-7} \frac{I_1}{d_1} = 2 \times 10^{-7} \frac{I_2}{d_2}$$

$$\frac{I_1}{d_1} = \frac{I_2}{d_2}$$

$$\frac{2}{d_1} = \frac{8}{d - d_1}$$

$$m = m_1 + m_2 = 0.4 + 0.6 = 1 \text{ kg}$$

$$d = \frac{m_1 \vec{r}_1 + m_2 \vec{r}_2}{m_1 + m_2}$$

$$= \frac{(0.4)(-0.2) + (0.6)(0.8)}{1}$$

$$d = 0.4 \text{ m}$$

$$\Rightarrow T_0 = 2\pi \sqrt{\frac{0.4}{1 \times 10 \times 0.4}} = 2 \text{ s}$$

$$\Delta E_k = \sum \vec{w} \cdot \vec{F} \quad (2)$$

$$E_{k2} - E_{k1} = W_{\vec{w}} + W_{\vec{R}}$$

الوضع الابتدائي (1): $\theta = \theta_{max}$
و بدون سرعة ابتدائية

الوضع النهائي (2): $\theta = 0$

$$\frac{1}{2} I_0 \omega^2 - 0 = mgh + 0$$

نقطة تأثير
R تنقل

$$\omega = \sqrt{\frac{2mgd(1 - \cos \theta_{max})}{I_0}}$$

$$\omega = \sqrt{\frac{2(1)(10)(0.4)(1 - \frac{1}{2})}{0.4}}$$

$$\omega = \pi \text{ rad.s}^{-1}$$

$$v_c = \omega \cdot r_c = \omega \cdot d = 0.4\pi \text{ m.s}^{-1}$$

$$p = \frac{h}{\lambda} = \frac{6.6 \times 10^{-34}}{0.5 \times 10^{-6}} \quad (1)$$

$$p = 13.2 \times 10^{-28} \text{ Kg} \cdot \text{m} \cdot \text{s}^{-1}$$

$$\Delta E_k = \sum \bar{W}_F \quad (1)$$

$$E_{k2} - E_{k1} = W_F$$

$$0 - E_{k1} = f \cdot d = eEd$$

$$-E_{k1} = -eU_0 \Rightarrow$$

$$U_0 = \frac{E_{k1}}{e} = \frac{9.6 \times 10^{-20}}{1.6 \times 10^{-19}}$$

$$U_0 = 0.6 \text{ V}$$

السؤال الرابعة:

$$q_{\text{max}} = C \times U_{\text{max}} \quad (1)$$

$$= 10^{-12} \times 10^3 = 10^{-9} \text{ C}$$

$$f_0 = \frac{1}{T_0} = \frac{1}{2\pi \sqrt{LC}} \quad (2)$$

$$= \frac{1}{2\pi \sqrt{10^{-3} \times 10^{-12}}} = \frac{1}{2\sqrt{\pi^2 \times 10^{-15}}}$$

$$= \frac{1}{2\sqrt{10^{-14}}} = 0.5 \times 10^6 = 5 \times 10^5 \text{ Hz}$$

$$i = \omega_0 q_{\text{max}} \cos(\omega_0 t + \frac{\pi}{2}) \quad (3)$$

$$\omega_0 = 2\pi f_0 = 2\pi \times 5 \times 10^5$$

$$= \pi \times 10^6 \text{ rad} \cdot \text{s}^{-1}$$

$$\frac{d}{d_1} = \frac{8}{8-d_1} \Rightarrow$$

$$8d_1 = 48 - 8d_1 \Rightarrow 16d_1 = 48$$

$$d_1 = \frac{48}{16} = \frac{24}{7} \text{ cm} = \frac{24}{7} \times 10^{-2} \text{ m}$$

السؤال الخامسة:

$$E = hf = h \frac{c}{\lambda} \quad (1)$$

$$= 6.6 \times 10^{-34} \times \frac{3 \times 10^8}{0.5 \times 10^{-6}}$$

$$= 39.6 \times 10^{-20} \text{ J} > E_s$$

فترد الإلكترون

$$E_s = hf_s \Rightarrow f_s = \frac{E_s}{h} \quad (2)$$

$$f_s = \frac{3 \times 10^{-19}}{6.6 \times 10^{-34}} = 0.45 \times 10^{15} \text{ Hz}$$

$$\lambda_s = \frac{c}{f_s} = \frac{3 \times 10^8}{0.45 \times 10^{15}} = 6.6 \times 10^{-7} \text{ m}$$

$$E_k = E - E_s \quad (3)$$

$$= 39.6 \times 10^{-20} - 30 \times 10^{-20}$$

$$= 9.6 \times 10^{-20} \text{ J}$$

$$E_k = \frac{1}{2} m_e v^2 \Rightarrow v = \sqrt{\frac{2E_k}{m_e}}$$

$$v = \sqrt{\frac{2 \times 9.6 \times 10^{-20}}{9 \times 10^{-31}}} = \sqrt{2.31 \times 10^{11}}$$

$$v \approx 15.2 \times 10^5 \text{ m} \cdot \text{s}^{-1}$$

$$T_0' = \frac{1}{2} T_0 = \frac{1}{2} (4) = 2 \text{ S}$$

$$Q' = \frac{V}{\Delta t} \Rightarrow \Delta t = \frac{V}{Q'} \quad (2)$$

$$\Delta t = \frac{2000 \times 10^{-3}}{0.04} = \frac{200}{4} = 50 \text{ S}$$

$$B = 2\pi \times 10^{-7} \frac{N}{r} I \quad (3)$$

$$B = 2\pi \times 10^{-7} \frac{N}{r} \frac{V}{R}$$

$$B = 2\pi \times 10^{-7} \frac{400}{20 \times 10^{-2}} \frac{200}{10}$$

$$B = 25 \times 10^{-3} \text{ T}$$

$$L = \frac{10^{-7} \times l^2}{l} = \frac{10 \times 25}{50 \times 10^{-2}} \quad (4)$$

$$L = 5 \times 10^{-6} \text{ H}$$

c (5)

11 ص 10 و 9 من كتاب (2)

2 ص 32 من كتاب + ص 34 أول الصفحتين (2)

$$\lambda' = \left(1 + \frac{v}{c}\right) \lambda \quad (3)$$

$$\lambda' = \lambda + \lambda \frac{v}{c} \Rightarrow$$

$$\lambda' - \lambda = \lambda \frac{v}{c} \Rightarrow \Delta \lambda = \lambda \frac{v}{c}$$

$$\frac{\Delta \lambda}{\lambda} = \frac{v}{c} = \frac{H_0 d}{c} \Rightarrow$$

$$\frac{1}{30} = \frac{68 \times 10^{19} \times d}{3 \times 10^8}$$

$$i = \pi \times 10^5 \times 10^{-9} \cos\left(\pi \times 10^5 t + \frac{\pi}{2}\right)$$

$$i = \pi \times 10^{-4} \cos\left(\pi \times 10^5 t + \frac{\pi}{2}\right) \quad (A)$$

$$E = \frac{1}{2} \frac{q_{\text{max}}^2}{C} = \frac{1}{2} \frac{10^{-18}}{10^{-12}} \quad (4)$$

$$= \frac{1}{2} \times 10^{-6} = 5 \times 10^{-7} \text{ J}$$

المسألة 1:

$$Q' = \frac{V}{\Delta t} = \frac{600 \times 10^{-3}}{300} = 2 \times 10^{-3} \text{ m.s}^{-1} \quad (1)$$

$$Q' = S \cdot v \Rightarrow v = \frac{Q'}{S} = \frac{2 \times 10^{-3}}{5 \times 10^{-4}} \quad (2)$$

$$v = 4 \text{ m.s}^{-1}$$

$$S_2 = \frac{1}{2} S_1 \quad (3)$$

$$S_1 v_1 = S_2 v_2$$

$$S_1 v_1 = \frac{1}{2} S_1 v_2 \Rightarrow$$

$$v_2 = 2 v_1 = 2 \times 4 = 8 \text{ m.s}^{-1}$$

غورد ج. (B)

$$T_0 = 2\pi \sqrt{\frac{I_0}{K}} \quad (1)$$

$$K = K' \frac{(2r)^4}{l}$$

بعد تقصير طول السلك

$$K^* = K' \frac{(2r)^4}{\frac{l}{4}} = 4 K' \frac{(2r)^4}{l}$$

$$K^* = 4K \Rightarrow$$

$$T_0' = 2\pi \sqrt{\frac{I_0}{4K}} = \frac{1}{2} \times 2\pi \sqrt{\frac{I_0}{K}}$$

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$$\varphi = -\frac{\pi}{3} \text{ rad} \Rightarrow$$

$$v = -2\pi \times 12 \times 10^{-2} \sin\left(-\frac{\pi}{3}\right)$$

$$v = +12\pi\sqrt{3} \times 10^{-2} \text{ m.s}^{-1} \text{ (ملاحظة)}$$

$$\bar{x} = 0.12 \cos\left(2\pi t + \frac{\pi}{3}\right) \text{ m}$$

$$X_0 = \frac{mg}{k} = \frac{mg}{\omega_0^2 m} \quad (2)$$

$$X_0 = \frac{g}{\omega_0^2} = \frac{10}{40} = \frac{1}{4} \text{ m}$$

$$X = 0 \text{ عند المرور بوضع التوازن} \quad (3)$$

$$\Rightarrow \cos\left(2\pi t + \frac{\pi}{3}\right) = 0$$

$$2\pi t + \frac{\pi}{3} = \pi k + \frac{\pi}{2}$$

$$2t + \frac{1}{3} = k + \frac{1}{2} \Rightarrow$$

$$2t = k + \frac{1}{2} - \frac{1}{3} = k + \frac{1}{6}$$

$$t = \frac{k}{2} + \frac{1}{12}$$

$$t = \frac{1}{12} \text{ s} \Leftrightarrow k=0 \text{ لحظة المرور الأول}$$

$$\Leftrightarrow k=1 \text{ لحظة المرور الثاني}$$

$$t = \frac{1}{2} + \frac{1}{12} = \frac{7}{12} \text{ s}$$

(6) (11)

$$v_{\text{max}} = |\dot{x}| = \omega_0 X_{\text{max}} \quad (4)$$

$$= 2\pi \times 12 \times 10^{-2} = 24\pi \times 10^{-2}$$

$$= 0.75 \text{ m.s}^{-1}$$

$$E = \frac{1}{2} k X_{\text{max}}^2 \Rightarrow k = \frac{2E}{X_{\text{max}}^2} \quad (5)$$

$$k = \frac{2 \times 0.072}{144 \times 10^{-4}} = 10 \text{ N.m}^{-1}$$

$$d = \frac{3 \times 10^8}{30 \times \frac{68}{3} \times 10^{-19}} = \frac{3}{68} \times 10^{26} \text{ m}$$

$$(1) \text{ الشريطية ص 143 من الكتاب}$$

$$\text{التعليق: ص 134 من الكتاب}$$

$$(2) \text{ ص 131 من الكتاب}$$

$$(3) \text{ ص 220 من الكتاب (الشريطية)}$$

$$\text{ص 221 من الكتاب (المواضع)}$$

الماتة الأخرى:

$$\bar{x} = X_{\text{max}} \cos(\omega_0 t + \bar{\varphi}) \quad (1)$$

$$\omega_0 = \frac{2\pi}{T_0} = \frac{2\pi}{1} = 2\pi \text{ rad.s}^{-1}$$

$$X_{\text{max}} = 12 \times 10^{-2} \text{ m}$$

متجه $\bar{\varphi}$ من شرط لبدي:

$$\left. \begin{array}{l} t=0 \\ \bar{x} = 6 \times 10^{-2} \text{ m} \end{array} \right\} \Rightarrow \bar{x} = X_{\text{max}} \cos(\omega_0 t + \bar{\varphi})$$

$$6 \times 10^{-2} = 12 \times 10^{-2} \cos \bar{\varphi}$$

$$\cos \bar{\varphi} = \frac{1}{2} \Rightarrow \bar{\varphi} = \pm \frac{\pi}{3} \text{ rad}$$

ننت، كلك الذي يجعل السرعة سالبة

$$v = -\omega_0 X_{\text{max}} \sin(\omega_0 t + \bar{\varphi})$$

$$\bar{\varphi} = +\frac{\pi}{3} \text{ rad} \Rightarrow$$

$$v = -2\pi \times 12 \times 10^{-2} \sin \frac{\pi}{3}$$

$$v = -24\pi \times 10^{-2} \times \frac{\sqrt{3}}{2}$$

$$v = -12\pi\sqrt{3} \times 10^{-2} \text{ m.s}^{-1}$$

هذا مقبول

المسألة الثانية:

$$F = N I L B \sin \theta \quad (1)$$

$$F = 100 \times 0.5 \times 4 \times 10^{-2} \times 0.06 \times 1 = 0.12 \text{ N}$$

$$\begin{aligned} \Gamma_{\Delta} &= S I N B \sin \alpha \\ &= 16 \times 10^{-4} \times 0.5 \times 100 \times 0.06 \times 1 \\ &= 48 \times 10^{-4} \text{ m.N} \end{aligned} \quad (2)$$

$$\begin{aligned} W &= \Gamma \cdot \Delta \phi \\ &= I N B S \Delta \cos \alpha \\ &= I N B S (\cos \alpha_2 - \cos \alpha_1) \\ &= 0.5 \times 100 \times 0.06 \times 16 \times 10^{-4} (1-0) \\ &= 48 \times 10^{-4} \text{ J} \end{aligned} \quad (3)$$

$$\theta' + \alpha = 90 \Rightarrow \alpha = 90 - \theta' \quad (4)$$

$$\alpha = 90 - 30 = 60^\circ$$

$$\begin{aligned} \Phi &= N B S \cos \alpha \\ &= 100 \times 0.06 \times 16 \times 10^{-4} \times \frac{1}{2} \\ &= 48 \times 10^{-4} \text{ weber} \end{aligned}$$

$$\sum \Gamma = 0 \quad (5)$$

$$\Gamma_{\Delta} + \Gamma_{\vec{m}} = 0$$

$$S I N B \sin \alpha - K \theta' = 0$$

6/ $\alpha + \theta' = \frac{\pi}{2}$ لأنه

$$\sin \alpha = \cos \theta'$$

$$\Rightarrow S I N B \cos \theta' - K \theta' = 0$$

لأنه θ' زاوية صغيرة بالتالي $\cos \theta' \approx 1$

$$S I N B = K \theta'$$

$$I = \frac{K \theta'}{S N B}$$

$$I = \frac{6 \times 10^{-4} \times 0.02}{16 \times 10^{-4} \times 100 \times 0.06} = 125 \times 10^{-5} \text{ A}$$

$$\theta' = G I \Rightarrow G = \frac{\theta'}{I} \quad (6)$$

$$G = \frac{0.02}{125 \times 10^{-5}} = 16 \text{ rad.A}^{-1}$$

(c) عندنا تزداد الحساسية إلى نصف تزداد قيمة G إلى نصف وتنقص حساسية K إلى النصف

$$K^* = \frac{K}{2} = \frac{6 \times 10^{-4}}{2} = 3 \times 10^{-4} \text{ mN rad}^{-1}$$

المسألة الثالثة:

$$\mu = \frac{N_s}{N_p} = \frac{375}{125} = 3 > 1 \quad (1)$$

المحول راسف للسنوتر - حافظته للثمة

$$U_{\text{eff}_s} = \frac{U_{\text{max}_s}}{\sqrt{2}} = \frac{120\sqrt{2}}{\sqrt{2}} = 120 \text{ V} \quad (2)$$

$$\mu = \frac{U_{\text{eff}_s}}{U_{\text{eff}_p}} \Rightarrow 3 = \frac{120}{U_{\text{eff}_p}}$$

$$U_{\text{eff}_p} = \frac{120}{3} = 40 \text{ V}$$

$$P_{avg} = P_{avg_R} + P_{avg_L} \quad (1)$$

$$= U_{eff} I_{eff_R} \cos \phi_R + 0$$

$$\Rightarrow 120 \times 4 \times 1 + 0 = 480 \text{ W}$$

المسألة الثانية:

$$\lambda = \frac{v}{f} = \frac{320}{160} = 2 \text{ m} \quad (1)$$

المسألة الثالثة:
بطول موجتنا لينة = $\frac{\lambda}{2} = \frac{2}{2} = 1 \text{ m}$

$$L = (2n - 1) \frac{\lambda}{4} \quad (2)$$

$$L = 1 \times \frac{2}{4} = \frac{1}{2} \text{ m}$$

المسألة الرابعة:
مختلفة الطول = λ
مشابهة الطول = λ

$$n \frac{v}{2L} = 160$$

$$1 \frac{320}{2L} = 160 \Rightarrow L = \frac{320}{2 \times 160}$$

$$L = 1 \text{ m}$$

$$\frac{v_1}{v_2} = \sqrt{\frac{M_2}{M_1}} \Rightarrow \frac{\lambda_1 f_1}{\lambda_2 f_2} = \sqrt{\frac{M_2}{M_1}} \quad (4)$$

$$\frac{160}{f_2} = \sqrt{\frac{2}{32}} = \frac{1}{4} \Rightarrow f_2 = 160 \times 4$$

$$f_2 = 640 \text{ Hz}$$

$$U_{eff_s} = R I_{eff_R} \quad (3)$$

$$120 = 30 I_{eff_R} \Rightarrow$$

$$I_{eff_R} = \frac{120}{30} = 4 \text{ A}$$

$$U_{eff_s} = X_L I_{eff_L} \quad (4)$$

$$120 = X_L (3) \Rightarrow$$

$$X_L = \frac{120}{3} = 40 \Omega$$

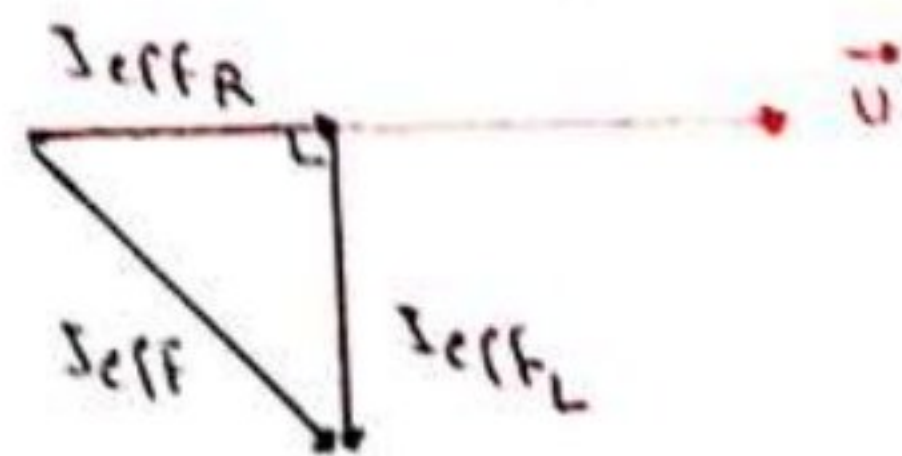
$$i = I_{max_L} \cos(\omega t + \phi_L)$$

$$I_{max_L} = I_{eff_L} \sqrt{2} = 3\sqrt{2} \text{ A}$$

$$\omega = 100\pi \text{ rad/s}^{-1}$$

$$\phi = -\frac{\pi}{2} \text{ rad}$$

$$\Rightarrow i = 3\sqrt{2} \cos(100\pi t - \frac{\pi}{2}) \quad (A) \quad (5)$$



$$I_{eff}^2 = I_{eff_R}^2 + I_{eff_L}^2$$

$$= 16 + 9 = 25$$

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

السؤال الثاني:

8 $P = mv = \gamma m_0 v$ (4)

$$P = 3 \times 1.87 \times 10^{-27} \times 2\sqrt{2} \times 10^8$$

$$P = 10.02 \sqrt{2} \times 10^{-19} \text{ Kg} \cdot \text{m} \cdot \text{s}^{-1}$$

نموذج 2: c

$$a = -\omega_0^2 \bar{x} \quad (1)$$

$$\omega_0 = \frac{2\pi}{T_0} = \frac{2\pi}{\pi} = 2 \text{ rad} \cdot \text{s}^{-1}$$

$$a = -4 \times 2 \times 10^{-2} = -0.08 \text{ m} \cdot \text{s}^{-2}$$

$$\Delta m = \frac{E_k}{c^2} = \frac{81 \times 10^{-16}}{9 \times 10^{16}} \quad (2)$$

$$\Delta m = 9 \times 10^{-32} \text{ kg}$$

كل $9 \times 10^{-31} \text{ kg}$ تترار بمقدار $9 \times 10^{-32} \text{ kg}$ كل 100kg

$$x = \frac{9 \times 10^{-32} \times 100}{9 \times 10^{-31}} = 10\%$$

B (3)

D (4)

(5)

البعد بينة نقطتين متاليتين $= \frac{\lambda}{2} = 20 \Rightarrow$

$$\lambda = 40 \text{ cm} = 0.4 \text{ m}$$

$$f = n \frac{v}{2L} \quad (10)$$

سبب v:

$$E_0 = m_0 c^2 \quad (1)$$

$$= 1.67 \times 10^{-27} \times 9 \times 10^{16}$$

$$= 15.03 \times 10^{-11} \text{ J}$$

$$E_0 = \frac{15.03 \times 10^{-11}}{1.6 \times 10^{-19}} \approx 9.4 \times 10^8 \text{ eV}$$

$$E = 3 E_0 \Rightarrow \quad (2)$$

$$m c^2 = 3 m_0 c^2 \Rightarrow$$

$$\left. \begin{matrix} m = 3 m_0 \\ m = \gamma m_0 \end{matrix} \right\} \Rightarrow \gamma = 3$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \Rightarrow 3 = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$9 = \frac{1}{1 - \frac{v^2}{c^2}} \Rightarrow 1 - \frac{v^2}{c^2} = \frac{1}{9}$$

$$\frac{v^2}{c^2} = 1 - \frac{1}{9} = \frac{8}{9} \Rightarrow v^2 = \frac{8}{9} c^2$$

$$v = \frac{2\sqrt{2}}{3} c = \frac{2\sqrt{2}}{3} \times 3 \times 10^8$$

$$v = 2\sqrt{2} \times 10^8 \text{ m} \cdot \text{s}^{-1}$$

$$E_k = E - E_0 = 3 E_0 - E_0 \quad (3)$$

$$= 2 E_0 = 2 \times 15.03 \times 10^{-11}$$

$$= 30.06 \times 10^{-11} \text{ J}$$

(4 ص)
السؤال الثالث:

$$K = \omega_0^2 I_0 \quad (1)$$

$$\omega_0 = \frac{2\pi}{T_0} = \frac{2\pi}{2} = \pi \text{ rad}\cdot\text{s}^{-1}$$

$$I_0 = I_0 + I_{01} + I_{02}$$

$$= 0 + m_1 r_1^2 + m_2 r_2^2$$

$$= 2 m_1 r_1^2 = 2 \times 100 \times 10^{-3} (20 \times 10^{-2})^2$$

$$= 8 \times 10^{-3} \text{ kg}\cdot\text{m}^2$$

$$\Rightarrow K = (\pi)^2 \times 8 \times 10^{-3} = 8 \times 10^{-2} \text{ mN rad}^{-1}$$

$$\bar{\theta} = \theta_{\text{max}} \cos(\omega_0 t + \bar{\varphi}) \quad (2)$$

$$\left. \begin{array}{l} t=0 \\ \omega=0 \end{array} \right\} \Rightarrow \theta_{\text{max}} = \theta = \frac{\pi}{3} \text{ rad}$$

$$\left. \begin{array}{l} t=0 \\ \theta = \theta_{\text{max}} \end{array} \right\} \Rightarrow \bar{\theta} = \theta_{\text{max}} \cos(\omega_0 t + \bar{\varphi})$$

$$\theta_{\text{max}} = \theta_{\text{max}} \cos \bar{\varphi}$$

$$\cos \bar{\varphi} = 1 \Rightarrow \bar{\varphi} = 0 \text{ rad}$$

$$\Rightarrow \bar{\theta} = \frac{\pi}{3} \cos(\pi t) \text{ rad}$$

$$\omega = -\omega_0 \theta_{\text{max}} \sin(\omega_0 t + \bar{\varphi}) \quad (3)$$

$$\omega = -\pi \times \frac{\pi}{3} \sin(\pi t)$$

$$\omega = -\frac{10}{3} \sin \pi t$$

لأنه لحظة المرور الأول بوضع التوازن

$$t = \frac{T_0}{4} = \frac{2}{4} = \frac{1}{2} \text{ s} \Rightarrow$$

$$\frac{v_1}{v_2} = \sqrt{\frac{T_1}{T_2}}$$

$$\frac{v_1}{331} = \sqrt{\frac{293 + 819}{293 + 0}}$$

$$\frac{v_1}{331} = \sqrt{\frac{1092}{293}} = \sqrt{4} = 2 \Rightarrow$$

$$v_1 = 331 \times 2 = 662 \text{ m}\cdot\text{s}^{-1}$$

مسألة L: $\lambda = \frac{v}{f}$

$$L = \lambda = 0.4 \text{ m}$$

فرضية (*) :

$$f = \frac{662}{2(0.4)} = 827.5 \text{ Hz}$$

(1) ص 30 + 31 من الكتاب

(2) ص 60 من الكتاب

(3) ص 95 من الكتاب

(1) ص 180 من الكتاب

(2) ص 48 من الكتاب

(3) ص 226 من الكتاب

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$$\mathcal{E} = - \frac{\Delta \Phi}{\Delta t}$$

$$\Delta \Phi = N \Delta B S \cos \alpha \quad (3)$$

$$\Delta B = 4\pi \times 10^{-7} \frac{N}{l} \Delta i$$

$$\Delta B = 4\pi \times 10^{-7} \frac{10^3}{20 \times 10^{-2}} (0 - 10)$$

$$\Delta B = -2\pi \times 10^{-2} \text{ weber}$$

$$\Rightarrow \Delta \Phi = 1000 \times -2\pi \times 10^{-2} \times 4 \times 10^{-2} \times 1$$

$$\Delta \Phi = -0.8\pi = -2.5 \text{ weber}$$

$$\Rightarrow \mathcal{E} = - \frac{(-2.5)}{0.5} = 5 \text{ V}$$

بما أن $\mathcal{E} > 0 \Rightarrow \Delta \Phi < 0$ بالتالي تكون حبة التيار لقرص بحيث تكون خطوط الحقل المغناطيسي لقرصه ينعكس حبة خطوط الحقل المغناطيسي لقرصه

$$\mathcal{E} = -L \frac{di}{dt} = -\frac{1}{4} \times 4 = -1 \text{ V} \quad (4)$$

$$\text{عدد الملفات الملية} = \frac{\text{عدد طبقات الدشية}}{\text{عدد الملفات في الطبقة الواحدة}}$$

$$\text{عدد الملفات في الطبقة الواحدة} = \frac{\text{طول الدشية}}{\text{تقارب الملفات}} = \frac{20 \times 10^{-2}}{0.4 \times 10^{-3}} = 500$$

$$\Rightarrow \text{عدد الطبقات} = \frac{1000}{500} = 2$$

(3)

$$\omega = -\frac{10}{3} \sin \frac{\pi}{2} = -\frac{10}{3} \text{ rad.s}^{-1}$$

$$\alpha = -\omega^2 \theta = -\left(\frac{10}{3}\right)^2 \times \frac{\pi}{4} \quad (4)$$

$$\alpha = + \frac{5\pi}{9} \text{ rad.s}^{-2}$$

$$T_0 = 2\pi \sqrt{\frac{I_0}{K}} \quad K = K' \frac{(2\pi)^4}{l} \quad (5)$$

عندما يصبح طول السلك $\frac{l}{2}$ فإنه:

$$K^* = K' \frac{(2\pi)^4}{\frac{l}{2}} = 2K' \frac{(2\pi)^4}{l} = 2K$$

$$T_0' = 2\pi \sqrt{\frac{I_0}{2K}} = \frac{1}{\sqrt{2}} \times 2\pi \sqrt{\frac{I_0}{K}}$$

$$T_0' = \frac{1}{\sqrt{2}} T_0 = \frac{2}{\sqrt{2}} \text{ s}$$

المثال الثانية:

(1)

$$L = 4\pi \times 10^{-7} \frac{N^2}{l} \text{ s} \Rightarrow$$

$$\frac{1}{4} = 4\pi \times 10^{-7} \frac{N^2}{20 \times 10^{-2}} \times 4 \times 10^{-2}$$

$$\Rightarrow N^2 = \frac{20 \times 10^{-2}}{4 \times 4\pi \times 10^{-7} \times 4 \times 10^{-2}} = 10^6$$

$$N = 1000 \text{ لفة}$$

$$E = \frac{1}{2} L I^2 = \frac{1}{2} \left(\frac{1}{4}\right) (8)^2 = 8 \text{ J} \quad (2)$$

السؤال الثالث:

$$X_L = \omega L = 100\pi \times \frac{1}{\pi} = 100 \Omega \quad (1)$$

$$X_C = \frac{1}{\omega C} = \frac{1}{100\pi \times \frac{1}{6000\pi}} = 60 \Omega$$

$$Z = \sqrt{R^2 + (\omega L - \frac{1}{\omega C})^2}$$

$$= \sqrt{900 + (100 - 60)^2} = \sqrt{900 + 1600}$$

$$= \sqrt{2500} = 50 \Omega$$

$$U_{eff} = Z I_{eff} \quad (2)$$

$$50 = 50 I_{eff} \Rightarrow I_{eff} = 1A$$

$$U_{eff} = R I_{eff} = 30 \times 1 \quad (3)$$

$$= 30V$$

$$P_{avg} = U_{eff} I_{eff} \cos \varphi \quad (4)$$

$$= 50 \times 1 \times 1 = 50W$$

(5) حالة طنين كهربائي

$$X_L = X_C$$

$$\omega L = \frac{1}{\omega C_{eq}}$$

$$C_{eq} = \frac{1}{\omega L \cdot \omega} = \frac{1}{100 \times 100\pi}$$

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

$$C_{eq} < C$$

الوصلة على التوالي

$$\frac{1}{C_{eq}} = \frac{1}{C} + \frac{1}{C'}$$

$$10000\pi = 6000\pi + \frac{1}{C'}$$

$$\Rightarrow \frac{1}{C'} = 10000\pi - 6000\pi$$

$$\frac{1}{C'} = 4000\pi \Rightarrow C' = \frac{1}{4000\pi} F$$

السؤال الرابع:

$$L = n \frac{\lambda}{2} \Rightarrow 2 = n \frac{0.5}{2} \quad (1)$$

$$\Rightarrow n = \frac{2 \times 2}{0.5} = 8 \text{ منازل}$$

$$\mu = \frac{m}{L} = \frac{20 \times 10^{-3}}{2} = 10^{-2} \text{ kg.m}^{-1} \quad (2)$$

$$f = n \frac{v}{2L} \Rightarrow 50 = 8 \frac{v}{2(2)} \quad (3)$$

$$v = \frac{50 \times 4}{8} = 25 \text{ m.s}^{-1}$$

$$v = \sqrt{\frac{F_T}{\mu}} \Rightarrow 25 = \sqrt{\frac{F_T}{10^{-2}}} \quad (4)$$

$$625 = \frac{F_T}{10^{-2}} \Rightarrow F_T = 6.25N \text{ نزع}$$

المائة الخامسة:

$$\dot{z} = \frac{q}{\sigma t} \Rightarrow \dot{z} = \frac{4e}{\sigma t}$$

$$n = \frac{\dot{z} \cdot \sigma t}{e} = \frac{16 \times 10^{-3} \times 1}{16 \times 10^{-20}} = 10^{17} \text{ المترزنة } (1)$$

$$E_k = \frac{1}{2} m_c v^2$$

$$= \frac{1}{2} \times 9 \times 10^{-31} \times 64 \times 10^{12}$$

$$= 288 \times 10^{-19} \text{ J} (2)$$

$$E_k = eU \Rightarrow U = \frac{E_k}{e}$$

$$U = \frac{288 \times 10^{-19}}{1.6 \times 10^{-19}} = 180 \text{ V}$$

نوز D

$$T_{01} = 2 T_{02} (1)$$

$$2\pi \sqrt{\frac{I_0}{k_1}} = 2 \times 2\pi \sqrt{\frac{I_0}{k_2}}$$

$$\frac{1}{k_1} = 4 \frac{1}{k_2} \Rightarrow k_2 = 4k_1$$

$$k' \frac{(2r)^4}{l_2} = 4k' \frac{(2r)^4}{l_1} \Rightarrow \frac{1}{l_2} = 4 \frac{1}{l_1}$$

$$l_1 = 4l_2$$

C (2)

$$\text{عدد اللغات البليزية} = \frac{\text{عدد اللغات في الطبقة الواحدة}}{\text{عدد الطبقات}} (3)$$

$$B = 4\pi \times 10^{-7} \frac{N}{l} I$$

$$6\pi \times 10^{-3} = 4\pi \times 10^{-7} \frac{N}{30 \times 10^{-2}} (15)$$

$$N = \frac{6\pi \times 10^{-3} \times 30 \times 10^{-2}}{4\pi \times 10^{-7} \times 15} = 300 \text{ لفات}$$

$$\text{عدد اللغات} = \frac{\text{طول الوشيتية}}{\text{مقتر السلك}} = \frac{30 \times 10^{-2}}{1 \times 10^{-3}} = 300 \text{ لفات}$$

$$\text{طبقة} = \frac{300}{300} = 1 \text{ طبقة}$$

(4) عند التوازن:

$$\sum \Gamma_D = 0$$

$$\Gamma_{\vec{w}_{1D}} + \Gamma_{\vec{R}_{1D}} + \Gamma_{\vec{F}_{1D}} + \Gamma_{\vec{w}_{1D}} = 0$$

ثابتة حامل القوة بمرصنة محور الدوران

$$\frac{r}{2} \times F - r \times w' = 0 \Rightarrow$$

$$\frac{1}{2} F = m' g \Rightarrow m' = \frac{F}{2g}$$

$$m' = \frac{2 \times 5 \times 10^{-2} \times 0.2 \times 1}{2 \times 10} = \frac{5 \times 10^{-2} \times 0.2 \times 1}{2 \times 10}$$

$$m' = 5 \times 10^{-3} \text{ kg}$$

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$$\frac{1}{2} m v_2^2 = G \frac{mM}{r^2} r$$

$$v_2 = \sqrt{\frac{2GM}{r}}$$

$$\Rightarrow v_2 = \sqrt{2} \sqrt{\frac{GM}{r}} = \sqrt{2} v_1$$

المسألة الأولى:

$$\Delta E_k = \sum \vec{w}_F$$

$$E_{k2} - E_{k1} = W_{\vec{w}} + W_{\vec{T}}$$

الوضع الابتدائي (1): $\theta = \theta_{max}$
وبدون سرعة ابتدائية

الوضع النهائي (2): $\theta = 0$

$$\frac{1}{2} m v^2 - 0 = mgh + 0$$

حاصل \vec{T} عماله الاشتغال بين كل لحظة

$$v^2 = 2gh \Rightarrow$$

$$v = \sqrt{2gl(1 - \cos\theta_{max})}$$

$$v = \sqrt{2(10)(11)(1 - \frac{1}{2})} = \pi \text{ m.s}^{-1}$$

$$\sum \vec{F} = m\vec{a} \quad (2)$$

$$\vec{w} + \vec{T} = m\vec{a}$$

بالقاط عماله الجوز اللازم الذي له نفس
حاصل \vec{T} رصبة

$$-w + T = ma_c$$

$$T = mg + m \frac{v^2}{r}$$

$$T = mg + m \frac{2gl(1 - \cos\theta_{max})}{l}$$

$$u = \frac{3 \times 10^8}{2 \times 10^8} \Rightarrow \lambda = \frac{3 \times 10^8}{12}$$

$$I_{effp} = 3 \times 12 = 36 \text{ A}$$

(1) صفة 14 من كتاب

(2) صفة 92 من كتاب

(3) صفة 101 من كتاب

غير انفعاد المغناطيسية عبر الوضعية

$$\mathcal{E} = - \frac{\Delta \phi}{\Delta t}$$

\mathcal{E} : القوة الدافعة الكهربية المتحصنة (v)

$\Delta \phi$: تغير انفعاد المغناطيسية الموضعية (weber)

Δt : زمن تغير انفعاد المغناطيسية الموضعية (s)

(4) صفة 103 من كتاب

(1) صفة 147 من كتاب + 148

(2) صفة 78 من كتاب

(3) صفة 101 من كتاب

$$f_c = f_E$$

$$m a_c = G \frac{Mm}{r^2}$$

$$m \frac{v^2}{r} = G \frac{Mm}{r^2}$$

$$v_1 = \sqrt{\frac{GM}{r}}$$

السرعة الكونية النهائية

$$E_k = E_p$$

$$\frac{1}{2} m v_2^2 = f_c \cdot r$$

$$w = 6.5x$$

$$w = 2mg \cdot v \cdot \Delta t$$

$$= 2 \times 10 \times 10^{-3} \times 10 \times 0.2 \times 2$$

$$= 8 \times 10^{-2} \text{ J}$$

(3) عندما يتحرك السلك بسرعة ثابتة ينتقل خلال فاصل زمني Δt مسافة

$$\Delta x = v \cdot \Delta t$$

وعندها يمسح السلك سطحاً مستطلياً مسطحاً

$$\Delta S = L \cdot \Delta x = L \cdot v \cdot \Delta t$$

وعندها يتغير التدفق المغناطيسي بمرور

$$\Delta \Phi = B \cdot \Delta S = B L \cdot v \cdot \Delta t$$

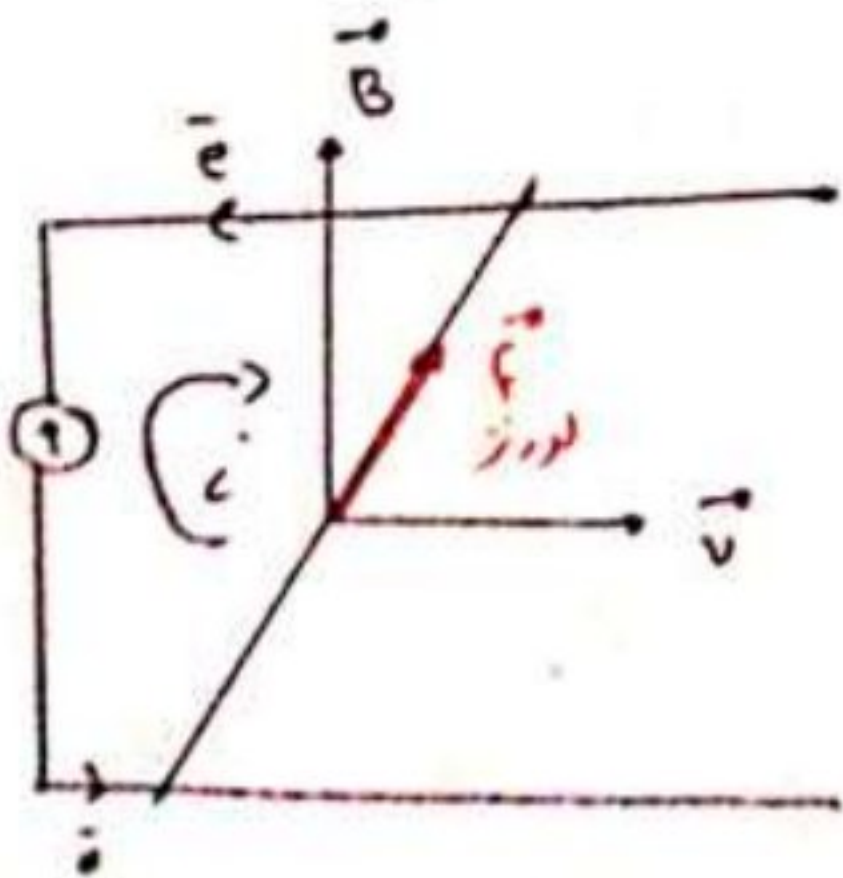
نتجت قوة حركية كهربية مترصنة

$$\mathcal{E} = \left| \frac{\Delta \Phi}{\Delta t} \right| = \frac{B L v \cdot \Delta t}{\Delta t}$$

$$\mathcal{E} = B L \cdot v = 25 \times 10^{-3} \times 40 \times 10^{-2} \times 5$$

$$\mathcal{E} = 5 \times 10^{-2} \text{ V}$$

$$i = \frac{\mathcal{E}}{R} = \frac{5 \times 10^{-2}}{5} = 1 \times 10^{-2} \text{ A}$$



$$T = mg + 2mg - 2mg \cos \theta_{max}$$

$$T = 3mg - 2mg \cos \theta_{max}$$

$$T = mg (3 - 2 \cos \theta_{max})$$

$$T = 0.1 \times 10 (3 - 2(\frac{1}{2})) = 2 \text{ N}$$

$$T_0' \approx T_0 \left[1 + \frac{\theta_{max}^2}{16} \right] \quad (3)$$

$$T_0 = 2\pi \sqrt{\frac{l}{g}} = 2\pi \sqrt{\frac{1}{10}} = 2.5$$

$$\Rightarrow T_0' \approx 2 \left[1 + \frac{(\frac{\pi}{3})^2}{16} \right]$$

$$\approx 2 \left[1 + \frac{10}{144} \right]$$

$$\approx 2 \left[\frac{154}{144} \right] \approx 2.135$$

$$\alpha = \frac{a_t}{v} = \frac{g \sin \theta}{l} = \frac{10 \times \frac{1}{2}}{1} \quad (4)$$

$$= 5 \text{ rad.s}^{-2}$$

$$F = 2w$$

$$I L B \sin \theta = 2mg$$

$$B = \frac{2mg}{I L \sin \theta} = \frac{2 \times 10 \times 10^{-3} \times 10}{20 \times 40 \times 10^{-2} \times 1}$$

$$B = 25 \times 10^{-3} \text{ T}$$

السلك الثاني: (1)

$$i_1 = I_{eff_1} \cos(\omega t + \varphi_1) \quad (1)$$

$$I_{eff_1} = I_{eff} \sqrt{2} = 3\sqrt{2} \text{ A}$$

$$\omega = 100\pi \text{ rad/s}$$

$$\varphi_1 = -\frac{\pi}{2} \text{ rad}$$

$$i_1 = 3\sqrt{2} \cos(100\pi t - \frac{\pi}{2}) \quad (A) \quad (2)$$

$$P_{avg_1} = U_{eff} I_{eff_1} \cos \varphi_1 \quad (3)$$

$$= 60 \times 4 \times 1 = 240 \text{ W}$$

$$P_{avg_2} = 0 \text{ W} \quad \leftarrow \varphi_2 = \frac{\pi}{2} \text{ rad}$$

$$\Rightarrow P_{avg} = P_{avg_1} + P_{avg_2}$$

$$= 240 + 0 = 240 \text{ W}$$

$$\cos \varphi = \frac{P_{avg}}{U_{eff} \cdot I_{eff}} = \frac{240}{60 \times 5}$$

$$= \frac{4}{5} = 0.8$$

المسألة الرابعة:

$$U_{eff_1} = \frac{U_{max}}{\sqrt{2}} = \frac{120\sqrt{2}}{\sqrt{2}} \quad (1)$$

$$= 120 \text{ V}$$

$$\omega = 100\pi = 2\pi f \Rightarrow$$

$$f = \frac{100\pi}{2\pi} = 50 \text{ Hz}$$

$$P = \epsilon \cdot i \quad (1)$$

$$P = 5 \times 10^2 \times 1 \times 10^{-7} = 5 \times 10^{-4} \text{ W}$$

$$f = i L B \sin \theta$$

$$= 1 \times 10^{-2} \times 40 \times 10^{-2} \times 25 \times 10^{-3} \times 1$$

$$= 10^{-4} \text{ N}$$

المسألة الخامسة:

$$U_{eff} = \frac{U_{max}}{\sqrt{2}} = \frac{60\sqrt{2}}{\sqrt{2}} = 60 \text{ V} \quad (1)$$

$$\omega = 100\pi = 2\pi f \Rightarrow f = \frac{100\pi}{2\pi}$$

$$f = 50 \text{ Hz}$$

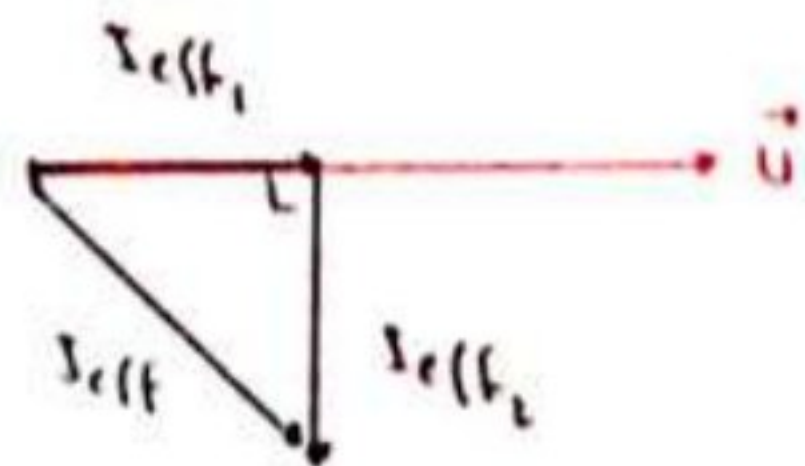
$$U_{eff} = R I_{eff_1} \quad (2)$$

$$60 = R(4) \Rightarrow R = \frac{60}{4} = 15 \Omega$$

$$U_{eff} = X_L I_{eff_2}$$

$$60 = X_L(3) \Rightarrow X_L = \frac{60}{3} = 20 \Omega$$

(3)



$$I_{eff}^2 = I_{eff_1}^2 + I_{eff_2}^2$$

$$= 16 + 9 = 25$$

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

المسألة الأولى:

$$\Delta E_k = \sum \vec{w}_f$$

$$E_{k_2} - E_{k_1} = \vec{F} \cdot d = eE \cdot d = eU$$

$$\frac{1}{2} m v^2 - 0 = eU \Rightarrow$$

$$v = \sqrt{\frac{2eU}{m}} = \sqrt{\frac{2 \times 1.6 \times 10^{-19} \times 1125}{9 \times 10^{-31} \times 4}}$$

$$v = 10^7 \text{ m.s}^{-1}$$

حساب التسارع:

$$v^2 - v_0^2 = 2ad$$

$$a = \frac{v^2}{2d} = \frac{10^{14}}{2 \times 1 \times 10^2}$$

$$a = 5 \times 10^{15} \text{ m.s}^{-2}$$

المدرس فراس قلعه جي
إجازة في العلوم الفيزيائية والكيميائية
دبلوم في التربية ١٠.١٦.١١
٠٩٨.٠٠٤٠٤٧٤

$$u = \frac{I_{effp}}{I_{effs}} \Rightarrow z = \frac{I_{effp}}{5} \quad (2)$$

$$I_{effp} = 10 \text{ A}$$

$$U_{effs} = R I_{effR} \quad (a) \quad (3)$$

$$120 = R(4) \Rightarrow R = \frac{120}{4}$$

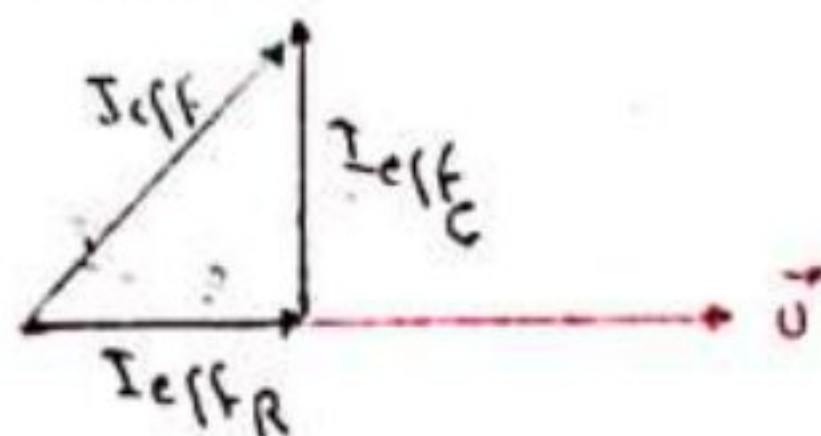
$$R = 30 \Omega$$

$$P_{avg} = U_{effs} \cdot I_{effR} \cdot \cos \varphi$$

$$= 120 \times 4 \times 1 = 480 \text{ W}$$

$$X_c = \frac{1}{\omega C} = \frac{1}{100\pi \times \frac{1}{4000\pi}} \quad (b)$$

$$X_c = 40 \Omega$$



$$I_{effs}^2 = I_{effR}^2 + I_{effC}^2$$

$$25 = 16 + I_{effC}^2 \Rightarrow$$

$$I_{effC}^2 = 25 - 16 = 9 \Rightarrow I_{effC} = 3 \text{ A}$$

$$i_c = I_{mxc} \cos(\omega t + \varphi_c)$$

$$I_{mxc} = I_{effC} \sqrt{2} = 3\sqrt{2} \text{ A}$$

$$\omega = 100\pi \text{ rad.s}^{-1}$$

$$\varphi_c = +\frac{\pi}{2} \text{ rad}$$

$$i_c = 3\sqrt{2} \cos(100\pi t + \frac{\pi}{2}) \quad (A)$$