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- | | | |
|--------|--------|--------|
| B (36) | C (35) | B (34) |
| C (39) | C (38) | D (37) |
| A (42) | C (41) | C (40) |
| | | D (43) |

تسم الطالب الجيد

$$P_{avg} = U_{eff} I_{eff} \cos \phi \quad (1)$$

$$Z = \sqrt{r^2 + (\omega L)^2}$$

$$Z = \sqrt{(80)^2 + (100\pi \times \frac{3}{5\pi})^2}$$

$$Z = \sqrt{6400 + 3600} = \sqrt{10000} = 100 \Omega$$

$$U_{eff} = Z I_{eff}$$

$$100 = 100 I_{eff} \Rightarrow I_{eff} = 1A$$

$$\cos \phi = \frac{r}{Z} = \frac{80}{100} = 0.8 \Rightarrow$$

$$P_{avg} = 100 \times 1 \times 0.8 = 80 W$$

الجواب (B)

(2) اشتهر بنتيجة أوبرا ما يمكنه حالة طينته
كهربائية

$$X_L = X_C$$

$$\omega L = \frac{1}{\omega C} \Rightarrow$$

$$C = \frac{1}{\omega \cdot \omega L} = \frac{1}{100\pi \cdot 100\pi \times \frac{1}{20\pi}}$$

$$C = \frac{1}{500\pi} F \quad \text{الجواب (A)}$$

هل إنك المؤتمت لبحث
التيار المتناوب الجيبي
تسم الطالب الجيد

- | | | |
|--------|--------|--------|
| A (3) | C (2) | B (1) |
| C (6) | D (5) | D (4) |
| A (9) | C (8) | B (7) |
| C (12) | B (11) | D (10) |

تسم الطالب المتوسط

- | | | |
|--------|--------|--------|
| C (3) | C (2) | C (1) |
| D (6) | B (5) | C (4) |
| B (9) | C (8) | C (7) |
| B (12) | D (11) | A (10) |
| D (15) | C (14) | D (13) |
| C (18) | A (17) | C (16) |
| C (21) | A (20) | B (19) |
| | A (23) | B (22) |

$$X_L = \omega L = 10 \Rightarrow L = \frac{10}{\omega} = \frac{10}{2\pi \times 50} \quad (24)$$

$$L = \frac{10}{100\pi} = \frac{1}{10\pi} H$$

الجواب (C)

- | | | |
|--------|--------|--------|
| C (27) | D (26) | A (25) |
| C (30) | B (29) | C (28) |
| D (33) | B (32) | C (31) |

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$$\vec{I}_{eff} = \vec{I}_{eff1} + \vec{I}_{eff2} \quad (5)$$

$$I_{eff}^2 = I_{eff1}^2 + I_{eff2}^2 + 2 I_{eff1} I_{eff2} \cos(\varphi_2 - \varphi_1)$$

$$64 = 25 + 36 + 2(5)(6) \cos(\varphi_2 - 0)$$

$$64 = 61 + 60 \cos \varphi_2 \Rightarrow \cos \varphi_2 = \frac{3}{60}$$

$$\cos \varphi_2 = \frac{1}{20} = 0.05$$

الجواب (D)

$$U_{eff} = Z I_{eff} \quad (6)$$

$$20 = Z(2) \Rightarrow Z = \frac{20}{2} = 10 \Omega$$

الجواب (A)

$$\cos \varphi = \frac{r}{Z} \Rightarrow r = Z \cdot \cos \varphi \quad (7)$$

$$r = 10 \times \frac{1}{2} = 5 \Omega \quad \text{الجواب (B)}$$

$$I_{max} = I_{eff} \sqrt{2} = 3\sqrt{2} A$$

$$\omega = 2\pi f = 2\pi \times 60 = 120\pi \text{ rad}\cdot s^{-1}$$

$$\cos \varphi = \frac{1}{\sqrt{2}} \Rightarrow \varphi = -\frac{\pi}{4} \text{ rad}$$

$$\Rightarrow i = I_{max} \cos(\omega t + \varphi)$$

$$i = 3\sqrt{2} \cos(120\pi t - \frac{\pi}{4}) \quad \text{الجواب (A)}$$

$$U_{eff} = X_C I_{eff2} = \frac{1}{\omega C} I_{eff2} \quad (9)$$

$$100 = \frac{1}{100\pi \times \frac{\sqrt{2}}{200\pi}} I_{eff2} \Rightarrow$$

$$I_{eff2} = 100 \times \frac{\sqrt{2}}{2} = 50\sqrt{2} A$$

$$\text{لوصلة على التوالي } I_{eff2} = I_{eff1} = I_{eff}$$

$$Z = \sqrt{R^2 + (\frac{1}{\omega C})^2} \quad (3)$$

$$Z = \sqrt{(20)^2 + (\frac{1}{100\pi \times \frac{1}{200\pi}})^2}$$

$$Z = \sqrt{400 + 400} = \sqrt{800} = 20\sqrt{2} \Omega$$

$$U_{eff} = Z I_{eff}$$

$$200 = 20\sqrt{2} I_{eff} \Rightarrow$$

$$I_{eff} = \frac{200}{20\sqrt{2}} = \frac{10}{\sqrt{2}} = 5\sqrt{2} A \quad \text{الجواب (D)}$$

$$\text{متواصل } U = r I \quad (4)$$

$$12.5 = r(0.5) \Rightarrow$$

$$r = \frac{12.5}{0.5} = 25 \Omega$$

$$\text{متناوب } U_{eff} = Z I_{eff} = \sqrt{r^2 + (\omega L)^2} I_{eff}$$

$$130 = \sqrt{625 + (100\pi L)^2} \times 2$$

$$65 = \sqrt{625 + (100\pi L)^2}$$

تربيع الطرفين

$$4 \times 225 - 625 = (100\pi L)^2$$

$$(100\pi L)^2 = 3600 \Rightarrow 100\pi L = 60$$

$$L = \frac{60}{100\pi} = \frac{3}{5\pi} H \quad \text{الجواب (C)}$$

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3/

$$\cos \varphi = \frac{r}{Z} = \frac{r}{\sqrt{r^2 + (\omega L)^2}} \quad (13)$$

$$\frac{3}{11} = \frac{r}{\sqrt{r^2 + (20)^2}} \Rightarrow \text{نربع}$$

$$\frac{9}{10} = \frac{r^2}{r^2 + 400} \Rightarrow 10r^2 = 9r^2 + 3600$$

$$r^2 = 3600 \Rightarrow r = 60 \Omega \quad \text{الجواب (ج)}$$

$$I_{eff} = I'_{eff} \quad (14)$$

بدايات متكافئة

$$\frac{U_{eff}}{Z} = \frac{U'_{eff}}{Z'} \Rightarrow$$

$$Z = Z'$$

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

$$\omega L = \begin{cases} +(\omega L - \frac{1}{\omega C}) \\ -(\omega L - \frac{1}{\omega C}) \end{cases}$$

ب) $\omega L = \omega L - \frac{1}{\omega C} \Rightarrow \frac{1}{\omega C} = 0 \Rightarrow$

حده منفرجه

$$C = \frac{1}{\omega \times 0} = \infty$$

أ) $\omega L = -\omega L + \frac{1}{\omega C} \Rightarrow \frac{1}{\omega C} = 2\omega L$

$$C = \frac{1}{\omega \cdot 2\omega L} = \frac{1}{100\pi \times 2 \times 100\pi \times \frac{2}{5\pi}}$$

$$C = \frac{1}{8000\pi} \text{ f} \quad \text{الجواب (د)}$$

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$$U_{eff} = X_L I_{eff} = \omega L I_{eff} \quad (10)$$

$$120 = 100\pi L (3) \Rightarrow L = \frac{120}{300\pi}$$

$$L = \frac{2}{9\pi} \text{ H} \quad \text{الجواب (ب)}$$

$$Z = \sqrt{R^2 + X_C^2} \Rightarrow \sqrt{2} = \sqrt{1^2 + X_C^2} \quad (11)$$

$$2 = 1 + X_C^2 \Rightarrow X_C^2 = 1 \Rightarrow X_C = 1 \Omega$$

$$U_{eff_2} = X_C I_{eff} \Rightarrow 100 = 1 \cdot I_{eff}$$

$$I_{eff} = 100 \text{ A}$$

$$I_{max} = I_{eff} \sqrt{2} = 100\sqrt{2} \text{ A}$$

$$\omega = 2\pi f = 2\pi \times 50 = 100\pi \text{ rad.s}^{-1}$$

$$\cos \varphi = \frac{r}{Z} = \frac{1}{\sqrt{2}} \Rightarrow \varphi = -\frac{\pi}{4} \text{ rad}$$

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

$$i = 100\sqrt{2} \cos(100\pi t - \frac{\pi}{4})$$

الجواب (ج)

$$Z = \sqrt{R^2 + (\frac{1}{\omega C})^2} \quad (12)$$

$$90 = \sqrt{(30)^2 + (\frac{1}{100\pi C})^2} \quad \text{نربع}$$

$$2500 = 900 + (\frac{1}{100\pi C})^2 \Rightarrow$$

$$1600 = (\frac{1}{100\pi C})^2 \Rightarrow \frac{1}{100\pi C} = 40$$

$$C = \frac{1}{4000\pi} \text{ f} \quad \text{الجواب (A)}$$

4/ $\omega = 2\pi f = 2\pi \times 50 = 100\pi \text{ rad/s}$ (22)

$$U_{eff2} = X_c I_{eff} = \frac{1}{\omega c} I_{eff}$$

Calc: $\frac{1}{\omega c} = \frac{1}{100\pi \times \frac{1}{15000}} = \frac{15}{\pi}$

$$U_{eff2} = \frac{15}{\pi} \times 2 = 30 \text{ V}$$

$$U_{max2} = U_{eff2} \sqrt{2} = 30\sqrt{2} \text{ V}$$

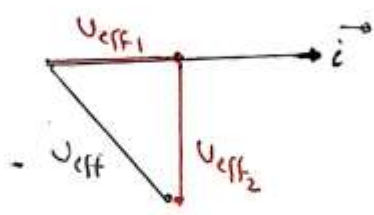
$$\omega = 2\pi f = 2\pi \times 50 = 100\pi \text{ rad/s}$$

$$\varphi_2 = -\frac{\pi}{2} \text{ rad} \Rightarrow$$

$$U_2 = U_{max2} \cos(\omega t + \varphi_2)$$

$$U_2 = 30\sqrt{2} \cos(100\pi t - \frac{\pi}{2})$$

 الجواب (A)



$$\vec{U}_{eff} = \vec{U}_{eff1} + \vec{U}_{eff2}$$

$$U_{eff}^2 = U_{eff1}^2 + U_{eff2}^2 \quad (1)$$

$$U_{eff1} = R I_{eff} = 20 \times 2 = 40 \text{ V}$$

$$U_{eff2} = X_c I_{eff} = \frac{1}{\omega c} I_{eff} = \frac{1}{100\pi \times \frac{1}{15000}} \times 2 = 30 \text{ V}$$

 فنكون بـ (1):

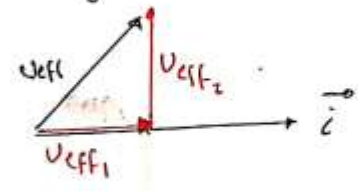
$$U_{eff}^2 = (40)^2 + (30)^2 = 1600 + 900$$

$$U_{eff}^2 = 2500 \Rightarrow U_{eff} = 50 \text{ V}$$

 الجواب (B)

$$E = R I_{eff}^2 \cdot dt = 10 \times (5)^2 \times 2 \times 60 \quad (15)$$

$$E = 3 \times 10^4 \text{ J} \quad \text{الجواب (A)}$$



$$\vec{U}_{eff} = \vec{U}_{eff1} + \vec{U}_{eff2}$$

$$U_{eff}^2 = U_{eff1}^2 + U_{eff2}^2$$

$$10000 = 6400 + U_{eff2}^2 \Rightarrow$$

$$U_{eff2}^2 = 3600 \Rightarrow U_{eff2} = 60 \text{ V}$$

$$U_{eff2} = X_L I_{eff} \Rightarrow (X_L = \omega L)$$

$$60 = 100\pi \cdot \frac{3}{5\pi} I_{eff} \Rightarrow I_{eff} = \frac{60}{60} = 1 \text{ A}$$

$$U_{eff1} = R I_{eff}$$

$$80 = R \cdot (1) \Rightarrow R = 80 \Omega$$

الجواب (B)

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- B (19) C (18) D (17)

A (20)

$$Z = \sqrt{R^2 + (X_L - X_C)^2} \quad (21)$$

$$Z = \sqrt{225 + 400} = \sqrt{625} = 25 \Omega$$

$$U_{eff} = Z I_{eff} \Rightarrow 50 = 25 I_{eff}$$

$$I_{eff} = \frac{50}{25} = 2 \text{ A} \quad \text{الجواب (A)}$$

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$$\vec{U}_{eff} = \vec{U}_{eff1} + \vec{U}_{eff2} \quad (27)$$

$$U_{eff}^2 = U_{eff1}^2 + U_{eff2}^2 \quad \text{(استناداً على مبدأ أضلاع مثلث)}$$

$$(50)^2 = (30)^2 + U_{eff2}^2 \Rightarrow$$

$$U_{eff2}^2 = 2500 - 1600 = 900$$

$$U_{eff2} = 30V$$

$$U_{eff2} = X_c \cdot I_{eff} = \frac{1}{\omega C} I_{eff}$$

$$30 = \frac{1}{100\pi} \times \frac{1}{200\pi} I_{eff}$$

$$30 = 2 I_{eff} \Rightarrow I_{eff} = \frac{30}{2} = 15A$$

$$U_{eff1} = R I_{eff} \Rightarrow 30 = R(15)$$

$$R = \frac{30}{15} = 2 \Omega \quad \text{(ب) الجواب}$$

$$\cos \varphi = \frac{R}{Z} \quad (28)$$

$$Z = \sqrt{R^2 + (\omega L)^2} = \sqrt{(100)^2 + (100\pi \times \frac{1}{\pi})^2}$$

$$Z = \sqrt{10000 + 10000} = 100\sqrt{2} \Omega$$

$$\Rightarrow \cos \varphi = \frac{100}{100\sqrt{2}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} \quad \text{(A) الجواب}$$

$$I_{eff} = I_{eff} \quad \text{(29)}$$

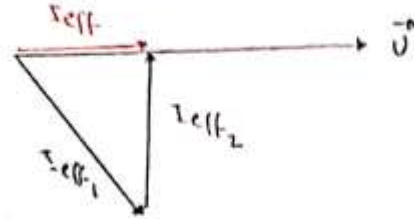
$$\frac{U_{eff}}{Z} = \frac{U_{eff}}{Z'}$$

$$Z = Z'$$

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

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$$I_{eff1}^2 = I_{eff}^2 + I_{eff2}^2 \quad \dots (1)$$

$$U_{eff} = X_c I_{eff2} = \frac{1}{\omega C} I_{eff2}$$

$$60 = \frac{1}{100\pi} \times \frac{1}{200\pi} I_{eff2} \Rightarrow$$

$$I_{eff2} = \frac{60}{2} = 30A$$

نوضه بـ (1):

$$I_{eff1}^2 = (40)^2 + (30)^2 = 1600 + 900$$

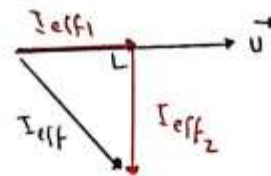
$$= 2500 \Rightarrow I_{eff1} = 50A$$

(A) الجواب

$$U_{eff} = Z_1 I_{eff1} \Rightarrow 80 = Z_1(2) \quad (25)$$

$$Z_1 = \frac{80}{2} = 40 \Omega \quad \text{(B) الجواب}$$

(26)



$$\vec{I}_{eff} = \vec{I}_{eff1} + \vec{I}_{eff2}$$

$$I_{eff}^2 = I_{eff1}^2 + I_{eff2}^2 = (4)^2 + (3)^2$$

$$= 16 + 9 = 25 \Rightarrow$$

$$I_{eff} = 5A \quad \text{(A) الجواب}$$

6 $\Rightarrow P_{avg} = 50(2)\left(\frac{3}{5}\right) = 60W$
الجواب (c)

$U_{eff_2} = X_L I_{eff} = 8(5) = 40V$ (33)

$U_{max_2} = U_{eff_2} \sqrt{2} = 40\sqrt{2} V$

$\omega = 2\pi f = 2\pi(50) = 100\pi \text{ rad}\cdot\text{s}^{-1}$

$\varphi = +\frac{\pi}{2} \text{ rad} \Rightarrow$

$U_2 = U_{max_2} \cos(\omega t + \bar{\varphi}_2)$

$= 40\sqrt{2} \cos(100\pi t + \frac{\pi}{2})$

الجواب (d)

$Z = \sqrt{R^2 + (X_L - X_C)^2}$ (34)

$= \sqrt{3^2 + (8-4)^2} = \sqrt{9+16} = \sqrt{25}$

$Z = 5 \Omega \Rightarrow \cos \varphi = \frac{R}{Z} = \frac{3}{5} = 0.6$

الجواب (c)

$P_{avg} = U_{eff} I_{eff} \cos \varphi$ (35)

$I_{eff} = \frac{I_{max}}{\sqrt{2}} = \frac{2\sqrt{2}}{\sqrt{2}} = 2A$

$Z = \sqrt{R^2 + (\omega L)^2} = \sqrt{3^2 + (100\pi \times \frac{1}{25\pi})^2}$

$Z = \sqrt{9+16} = \sqrt{25} = 5 \Omega$

$U_{eff} = Z I_{eff} = 5 \times 2 = 10V$

$\cos \varphi = \frac{R}{Z} = \frac{3}{5} \Rightarrow$

$P_{avg} = 10(2)\left(\frac{3}{5}\right) = 12W$

الجواب (c)

$X_C = \begin{cases} + (X_L - X_C) \\ - (X_L - X_C) \end{cases}$

بنا: $X_C = X_L - X_C \Rightarrow X_L = 2X_C$

$X_L = 2 \times 20 = 40 \Omega \Rightarrow \omega L = 40$

$L = \frac{40}{\omega} = \frac{40}{100\pi} = \frac{2}{5\pi} H$ الجواب (c)

أو: $X_C = -X_L + X_C \Rightarrow X_L = 0$

$\omega L = 0 \Rightarrow L = 0$ حل مقبول

$U_{eff_1} = R I_{eff} = 100 \times 2 = 200V$ (30)

$U_{eff_2} = X_L I_{eff} = \omega L I_{eff}$

$= 100\pi \times \frac{1}{\pi} \times 2 = 200V$

الجواب (d)

$U_{eff} = Z I_{eff} \quad (1)$ (31)

$U_{eff} = \frac{U_{max}}{\sqrt{2}} = \frac{120\sqrt{2}}{\sqrt{2}} = 120V$

نعوض ب (1):

$120 = Z(4.8) \Rightarrow Z = \frac{120}{4.8} = 25 \Omega$

الجواب (c)

$P_{avg} = U_{eff} I_{eff} \cos \varphi \quad \dots (1)$ (32)

$I_{eff} = \frac{I_{max}}{\sqrt{2}} = \frac{2\sqrt{2}}{\sqrt{2}} = 2A$

$Z = \sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2} = \sqrt{15^2 + \left(\frac{1}{100\pi \times \frac{1}{200\pi}}\right)^2}$

$Z = \sqrt{225 + 400} = \sqrt{625} = 25 \Omega$

$U_{eff} = Z I_{eff} = 25(2) = 50V \Rightarrow$

$\cos \varphi = \frac{R}{Z} = \frac{15}{25} = \frac{3}{5}$

(36)

1/ $\cos \varphi_2 = \frac{R}{Z_2} \quad (1)$

$$Z_2 = \sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2} = \sqrt{(50)^2 + \left(\frac{1}{100\pi \times \frac{1}{5000\pi}}\right)^2}$$

$$Z_2 = \sqrt{2500 + 2500} = \sqrt{5000} = 50\sqrt{2} \Omega$$

نفوض بـ (1):

$$\cos \varphi_2 = \frac{50}{50\sqrt{2}} = \frac{1}{\sqrt{2}}$$

نفوض بـ (2):

$$I_{eff}^2 = (2)^2 + (\sqrt{2})^2 + (2)(2)(\sqrt{2})\left(\frac{1}{\sqrt{2}}\right)$$

$$= 4 + 2 + 4 = 10 \Rightarrow I_{eff} = \sqrt{10} A$$

الجواب (C)

$$Z = \sqrt{r^2 + (\omega L)^2} \Rightarrow 20 = \sqrt{100 + (X_L)^2} \quad (40)$$

$$\Rightarrow 400 = 100 + X_L^2 \Rightarrow X_L^2 = 300$$

$$X_L = 10\sqrt{3} \Omega$$

$$U_{eff} = Z I_{eff} = \sqrt{(R+r)^2 + (X_L)^2} \cdot I_{eff}$$

$$40\sqrt{3} = \sqrt{(30)^2 + (10\sqrt{3})^2} \cdot I_{eff}$$

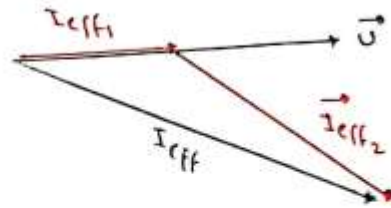
$$40\sqrt{3} = \sqrt{900 + 300} \cdot I_{eff}$$

$$40\sqrt{3} = \sqrt{1200} I_{eff}$$

$$40\sqrt{3} = 20\sqrt{3} I_{eff} \Rightarrow I_{eff} = \frac{40\sqrt{3}}{20\sqrt{3}}$$

$$I_{eff} = 2 A \quad \text{الجواب (B)}$$

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$$\vec{I}_{eff} = \vec{I}_{eff1} + \vec{I}_{eff2}$$

$$I_{eff}^2 = I_{eff1}^2 + I_{eff2}^2 + 2 I_{eff1} I_{eff2} \cos(\varphi_2 - \varphi_1)$$

$$= 36 + 100 + 2(6)(10)(0.5 - 0) = 196$$

$$\Rightarrow I_{eff} = 14 A \quad \text{الجواب (A)}$$

C (37)

(38)

$$U_{eff} = Z_2 I_{eff2} = \sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2} I_{eff2}$$

$$100 = \sqrt{(50)^2 + \left(\frac{1}{100\pi C}\right)^2} \times \sqrt{2}$$

نربع الطرفين:

$$10000 = \left(2500 + \left(\frac{1}{100\pi C}\right)^2\right) \times 2 \Rightarrow$$

$$5000 - 2500 = \left(\frac{1}{100\pi C}\right)^2 \Rightarrow$$

$$\left(\frac{1}{100\pi C}\right)^2 = 2500 \Rightarrow \frac{1}{100\pi C} = 50 \Rightarrow$$

$$C = \frac{1}{5000\pi} F \quad \text{الجواب (D)}$$

(39)

$$\vec{I}_{eff} = \vec{I}_{eff1} + \vec{I}_{eff2}$$

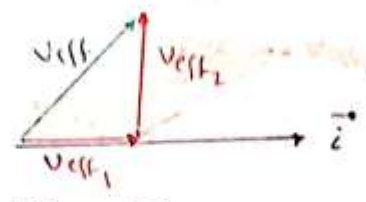
$$I_{eff}^2 = I_{eff1}^2 + I_{eff2}^2 + 2 I_{eff1} I_{eff2} \cos(\varphi_2 - \varphi_1) \quad (*)$$

$$U_{eff1} = R I_{eff1} \Rightarrow 100 = 50 I_{eff1}$$

$$I_{eff1} = \frac{100}{50} = 2 A$$

8/ $V_{eff} = R I_{eff} \Rightarrow 40\sqrt{3} = 20 I_{eff_1}$ (48)
 $I_{eff_1} = 2\sqrt{3} A$
 $V_{eff} = Z_2 I_{eff_2} \Rightarrow 40\sqrt{3} = 20 I_{eff_2}$
 $I_{eff_2} = 2\sqrt{3} A$
 $P_{avg_1} = V_{eff} I_{eff_1} \cos \varphi_1$
 $= 40\sqrt{3} \times 2\sqrt{3} \times 1 = 240 W$
 $P_{avg_2} = V_{eff} I_{eff_2} \cos \varphi_2$ $\cos \varphi_2 = \frac{r}{Z_2} = \frac{10}{20} = \frac{1}{2}$
 $= 40\sqrt{3} \times 2\sqrt{3} \times \frac{1}{2} = 120 W$
 $P_{avg} = P_{avg_1} + P_{avg_2} = 240 + 120 = 360 W$
 $\cos \varphi = \frac{P_{avg}}{V_{eff} I_{eff}}$ (*)
 $I_{eff} = \frac{P_{avg}}{V_{eff} \cos \varphi}$
 $I_{eff} = I_{eff_1} + I_{eff_2}$
 $I_{eff}^2 = I_{eff_1}^2 + I_{eff_2}^2 + 2 I_{eff_1} I_{eff_2} \cos(\varphi_2 - \varphi_1)$
 $= 12 + 12 + 2(12)(\frac{1}{2}) = 36$
 $I_{eff} = 6 A$
 $\cos \varphi = \frac{360}{40\sqrt{3} \times 6} = \frac{3}{2\sqrt{3}} = \frac{\sqrt{3}}{2}$ نفوض بـ (*):
 الجواب (D)
 $V_{eff} = Z I_{eff} = R I_{eff}$ (49)
 $120 = 30 I_{eff} \Rightarrow I_{eff} = \frac{120}{30}$
 $I_{eff} = 4 A$ الجواب (A)

C (43) A (42) D (41)
 C (45) D (44)



(46)
 $\vec{V}_{eff} = \vec{V}_{eff_1} + \vec{V}_{eff_2}$
 $V_{eff}^2 = V_{eff_1}^2 + V_{eff_2}^2$ (*)
 $V_{eff_2} = X_L I_{eff} = \omega L I_{eff}$
 $40 = 100\pi \times \frac{4}{5\pi} I_{eff} \Rightarrow$
 $40 = 80 I_{eff} \Rightarrow I_{eff} = \frac{40}{80} = 0.5 A$
 $V_{eff_1} = R I_{eff} = 60(0.5) = 30 V$
 نفوض بـ (*):
 $V_{eff}^2 = (30)^2 + (40)^2 = 900 + 1600 = 2500$
 $V_{eff} = 50 V$ الجواب (B)
 $\cos \varphi_2 = \frac{r}{Z_2} = \frac{r}{\sqrt{r^2 + (\omega L)^2}}$ (47)
 $0.8 = \frac{r}{\sqrt{r^2 + (30)^2}} \Rightarrow 0.64 = \frac{r^2}{r^2 + 900}$
 $r^2 = 0.64 r^2 + 576 \Rightarrow r^2 - 0.64 r^2 = 576$
 $0.36 r^2 = 576 \Rightarrow r^2 = \frac{576}{0.36} = 1600$
 $r = 40 \Omega$ الجواب (D)

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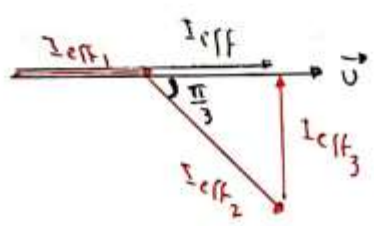
9/
$$\vec{I}_{eff} = \vec{I}_{eff1} + \vec{I}_{eff2}$$

$$I_{eff}^2 = I_{eff1}^2 + I_{eff2}^2 + 2I_{eff1}I_{eff2}\cos(\varphi_2 - \varphi_1)$$

$$I_{eff}^2 = (5)^2 + (6)^2 + 2(5)(6)(0.05)$$

$$= 25 + 36 + 3 = 64$$

$$\Rightarrow I_{eff} = 8A \quad \text{الجواب (B)}$$

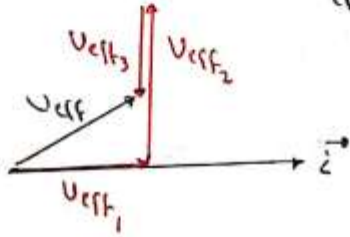


14/
$$U_{eff} = X_c I_{eff3} = \frac{1}{\omega C} I_{eff3}$$

$$I_{eff3} = I_{eff2} \sin \frac{\pi}{3} = 4 \times \frac{\sqrt{3}}{2} = 2\sqrt{3} A$$

$$120 = \frac{1}{100\pi C} 2\sqrt{3} \Rightarrow \text{نفسه بـ (1)}$$

$$C = \frac{2\sqrt{3}}{12000\pi} = \frac{\sqrt{3}}{6000\pi} F \quad \text{الجواب (B)}$$



5/
$$\vec{U}_{eff} = \vec{U}_{eff1} + \vec{U}_{eff2} + \vec{U}_{eff3}$$

$$U_{eff}^2 = U_{eff1}^2 + (U_{eff2} - U_{eff3})^2$$

$$= 3600 + 6400 = 10000$$

$$\Rightarrow U_{eff} = 100V \quad \text{الجواب (C)}$$

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50/
$$\vec{I}_{eff} = \vec{I}_{eff1} + \vec{I}_{eff2}$$

$$I_{eff}^2 = I_{eff1}^2 + I_{eff2}^2 + 2I_{eff1}I_{eff2}\cos(\varphi_2 - \varphi_1)$$

$$49 = 16 + 25 + 2(4)(5)\cos\varphi_2, \varphi_1 = 0$$

$$49 = 41 + 40\cos\varphi_2 \Rightarrow 8 = 40\cos\varphi_2$$

$$\cos\varphi_2 = \frac{8}{40} = \frac{1}{5} = 0.2 \quad \text{الجواب (C)}$$

مسر الطالب بلتفوت

1/
$$U_{eff} = Z I_{eff} \Rightarrow 200 = Z(10)$$

$$Z = \frac{200}{10} = 20 \Omega$$

$$Z = \sqrt{r^2 + (\omega L)^2} \Rightarrow 20 = \sqrt{(10\sqrt{3})^2 + (100\pi L)^2}$$

$$400 = 300 + (100\pi L)^2 \Rightarrow (100\pi L)^2 = 100$$

$$L = \frac{10}{100\pi} = \frac{1}{10\pi} H$$

$$L = 4\pi \times 10^{-7} \frac{N^2}{\ell} S \Rightarrow \frac{1}{10\pi} = 4\pi \times 10^{-7} \frac{N^2}{1} \frac{1}{40}$$

$$N^2 = \frac{40}{10\pi \times 4\pi \times 10^{-7}} = \frac{40}{40 \times 10^{-6}} = 10^6 \Rightarrow$$

$$N = 1000 \quad \text{لذا الجواب (A)}$$

2/
$$P_{avg} = P_{avg1} + P_{avg2}$$

$$= U_{eff} I_{eff1} \cos\varphi_1 + U_{eff} I_{eff2} \cos\varphi_2$$

$$= (200 \times 4 \times 1) + (200 \times 10 \times 0.8)$$

$$= 800 + 1600 = 2400W$$

$$\cos\varphi = \frac{P_{avg}}{U_{eff} I_{eff}} = \frac{2400}{200 \times 20} = 0.6 \quad \text{الجواب (D)}$$

10

الوصل على التوالي:

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$\frac{1}{C_{eq}} = 4000\pi + 2000\pi = 6000\pi \Rightarrow$$

$$C_{eq} = \frac{1}{6000\pi} \text{ f}$$

لفوضه ب (U):

$$L = \frac{1}{100\pi \cdot 100\pi \cdot \frac{1}{6000\pi}} = \frac{3}{5\pi} \text{ H}$$

البواب (D)

(9)

$$Z = \sqrt{r^2 + (\omega L)^2}$$

$$40 = \sqrt{400 + (\omega L)^2} \Rightarrow$$

$$1600 = 400 + (\omega L)^2 \Rightarrow$$

$$(\omega L)^2 = 1600 - 400 = 1200$$

$$\omega L = 20\sqrt{3} \Omega$$

$$Z_{\text{كلية}} = \sqrt{(r+R)^2 + (\omega L)^2}$$

$$= \sqrt{(60)^2 + (20\sqrt{3})^2}$$

$$= \sqrt{3600 + 1200} = \sqrt{4800}$$

$$= 40\sqrt{3} \Omega \quad \text{البواب (C)}$$

(10) حالة طينيه كهربائيه

$$X_L = X_C$$

$$\omega L = \frac{1}{\omega' C} \Rightarrow L = \frac{1}{\omega' \cdot \omega' C}$$

$$\omega' = 2\pi f' = 2\pi \cdot 25\sqrt{2} = 50\pi\sqrt{2} \text{ rad.s}^{-1}$$

$$\Rightarrow L = \frac{1}{50\pi\sqrt{2} \cdot 50\pi\sqrt{2} \cdot \frac{1}{4000\pi}} = \frac{4}{5\pi} \text{ H}$$

البواب (C)

(6) حالة طينيه كهربائيه

$$X_L = X_C$$

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

$$C_{eq} = \frac{1}{\omega \cdot \omega L} = \frac{1}{100\pi \times 100\pi \times \frac{4}{5\pi}}$$

$$C_{eq} = \frac{1}{8000\pi} \text{ f} < C$$

الوصل على التوالي

$$\frac{1}{C_{eq}} = \frac{1}{C} + \frac{1}{C'} \Rightarrow 8000\pi = 4000\pi + \frac{1}{C'}$$

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

البواب (B)

(7)

$$\cos \phi_2 = \frac{r}{Z_2} \Rightarrow Z_2 = \frac{20}{0.2} = 100 \Omega$$

$$U_{\text{eff}2} = Z_2 I_{\text{eff}} = 100 \times 8 = 800 \text{ V}$$

$$U_{\text{eff}1} = \frac{1}{4} U_{\text{eff}2} = \frac{1}{4} (800) = 200 \text{ V}$$

$$P_{\text{avg}} = P_{\text{avg}1} + P_{\text{avg}2}$$

$$= U_{\text{eff}1} I_{\text{eff}} \cos \phi_1 + U_{\text{eff}2} I_{\text{eff}} \cos \phi_2$$

$$= 200 \times 8 \times 1 + 800 \times 8 \times 0.2$$

$$= 1600 + 1280 = 2880 \text{ W}$$

البواب (B)

(8) حالة طينيه كهربائيه

$$X_L = X_C$$

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

$$L = \frac{1}{\omega \cdot \omega \cdot C_{eq}} \quad (11)$$

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$$U_{eff_1} = R I_{eff} \Rightarrow 90 = 30 I_{eff}$$

$$I_{eff} = \frac{90}{30} = 3 A$$

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

$$= U_{eff_1} I_{eff} \cos \phi_1 + U_{eff_2} I_{eff} \cos \phi_2$$

$$= 90 \times 3 \times 1 + 120 \times 3 \times 0 = 270 W$$

$$\cos \phi = \frac{P_{avg}}{U_{eff} \cdot I_{eff}} \quad (1)$$

حسب U_{eff} : اعتماداً على زينيل

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

$$= 8100 + 14400 = 22500$$

$$U_{eff} = 150 V$$

نوضح بـ (1):

$$\cos \phi = \frac{270}{150 \times 3} = \frac{9}{15} = \frac{3}{5} = 0.6$$

الجواب (B)

(15) حالة طنين كهر بائني

$$X_L = X_C \Rightarrow \omega L = \frac{1}{\omega C}$$

$$C = \frac{1}{\omega \cdot \omega L} \quad \dots (1) \quad \text{حسب } L:$$

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

$$U_{eff}^2 = U_{eff_1}^2 + U_{eff_2}^2 \quad \text{حسب زينيل:}$$

$$U_{eff}^2 = 8100 + 14400 = 22500$$

$$U_{eff} = 150 V$$

نوضح بـ (2):

$$150 = 30 I_{eff} \Rightarrow I_{eff} = \frac{150}{30} = 5 A$$

$$U_{eff_2} = X_L I_{eff} = \omega L I_{eff}$$

$$120 = 100 \pi L (5) \Rightarrow L = \frac{120}{500 \pi}$$

$$L = \frac{6}{25 \pi} H \quad \text{نوضح بـ (1):}$$

(11)

تغير الطاقة الحرارية = كمية الحرارة التي يكتسبها الماء البارد
التي تنقلها المقاومة

$$\frac{80}{100} R I_{eff}^2 \cdot dt = m C_0 \cdot \Delta t$$

$$\Leftrightarrow R = \frac{U_{eff}}{I_{eff}} \quad \text{نحو}$$

$$\frac{80}{100} \frac{U_{eff}}{I_{eff}} I_{eff}^2 \cdot dt = m C_0 \Delta t$$

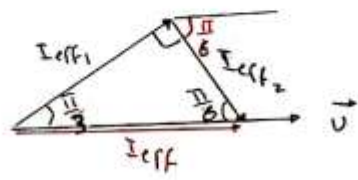
$$0.8 U_{eff} I_{eff} \cdot dt = m C_0 \Delta t$$

$$I_{eff} = \frac{m C_0 \Delta t}{0.8 U_{eff} \cdot dt}$$

$$= \frac{0.5 \times 4200 \times 80}{0.8 \times 100 \times 10 \times 60} = \frac{168000}{48000}$$

$$I_{eff} = 3.5 A \quad \text{الجواب (B)}$$

(12)

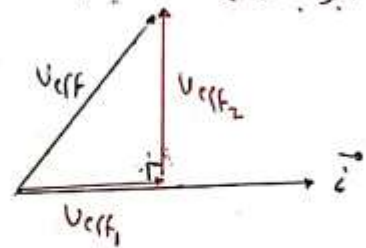


$$I_{eff_1} = I_{eff} \sin \frac{\pi}{6} = \sqrt{2} \times \frac{1}{2} = \frac{\sqrt{2}}{2} A$$

$$I_{eff_2} = I_{eff} \sin \frac{\pi}{3} = \sqrt{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{6}}{2} A$$

الجواب (B)

(13)



$$\vec{U}_{eff} = \vec{U}_{eff_1} + \vec{U}_{eff_2}$$

$$U_{eff}^2 = U_{eff_1}^2 + U_{eff_2}^2 = 8100 + 14400$$

$$U_{eff}^2 = 22500 \Rightarrow U_{eff} = 150 V \quad (D)$$

12

$$\Rightarrow C = \frac{1}{2000\pi} f \Rightarrow C_{eq} < C$$

الوصل على التوالي

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

$$4000\pi = 2000\pi + \frac{1}{C'} \Rightarrow \frac{1}{C'} = 2000\pi$$

$$C' = \frac{1}{2000\pi} f \quad \text{الجواب (A)}$$

$$Z = \sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2} \quad (19)$$

$$= \sqrt{400 + \left(\frac{1}{100\pi \times \frac{1}{1500\pi}}\right)^2}$$

$$= \sqrt{400 + 225} = \sqrt{625} = 25 \Omega$$

$$V_{eff} = Z I_{eff} \Rightarrow 50 = 25 I_{eff}$$

$$I_{eff} = \frac{50}{25} = 2 A \quad \text{cos}\phi = \frac{R}{Z} = \frac{20}{25} = \frac{4}{5}$$

$$P_{avg} = V_{eff} I_{eff} \text{cos}\phi$$

$$= 50 \times 2 \times \frac{4}{5} = 80 W \quad \text{الجواب (C)}$$

$$V_{eff} = Z I_{eff} = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2} I_{eff} \quad (20)$$

$$50 = \sqrt{900 + \left(100\pi \times \frac{1}{11} - \frac{1}{100\pi \times \frac{1}{6000\pi}}\right)^2} \cdot I_{eff}$$

$$50 = \sqrt{900 + 1600} I_{eff} \Rightarrow 50 = \sqrt{2500} I_{eff}$$

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

$$V_{eff1} = R I_{eff} = 30 \times 1 = 30 V \quad \text{الجواب (A)}$$

$$V_{eff2} = X_L I_{eff} = 100 \times 1 = 100 V$$

$$V_{eff2} = X_C I_{eff} = 60 \times 1 = 60 V$$

$$C = \frac{1}{100\pi \cdot 100\pi \times \frac{6}{25\pi}} = \frac{1}{2400\pi} f \quad \text{الجواب (C)}$$

$$\vec{V}_{eff} = \vec{V}_{eff1} + \vec{V}_{eff2} \quad (16)$$

اعتباراً على فترتيه

$$V_{eff}^2 = V_{eff1}^2 + V_{eff2}^2 = 8100 + 14400 = 22500$$

$$V_{eff} = 150 V$$

حاله طبيعيه كبريا

$$V_{eff} = Z I_{eff} = R I_{eff}$$

$$150 = 30 I_{eff} \Rightarrow I_{eff} = \frac{150}{30} = 5 A$$

$$P_{avg} = V_{eff} I_{eff} \text{cos}\phi$$

$$= 150 (5) (1) = 750 W \quad \text{الجواب (B)}$$

$$P_{avg} = V_{eff} I_{eff} \text{cos}\phi \quad (17)$$

$$V_{eff} = Z I_{eff} = \sqrt{R^2 + (X_L - X_C)^2} I_{eff}$$

$$50 = \sqrt{225 + 400} I_{eff} \Rightarrow 50 = 25 I_{eff}$$

$$I_{eff} = \frac{50}{25} = 2 A$$

$$\text{cos}\phi = \frac{R}{Z} = \frac{15}{25} = \frac{3}{5} \Rightarrow$$

$$P_{avg} = 50 \times 2 \times \frac{3}{5} = 60 W \quad \text{الجواب (C)}$$

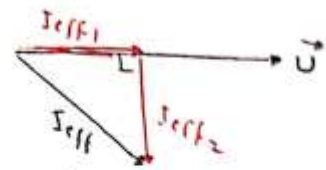
$$X_L = X_C \quad \text{حاله طبيعيه كبريا} \quad (18)$$

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

$$C_{eq} = \frac{1}{\omega \cdot \omega L} = \frac{1}{100\pi \times 40} = \frac{1}{4000\pi} f$$

$$X_C = \frac{1}{\omega C} \Rightarrow 20 = \frac{1}{100\pi C}$$

3



$$\vec{I}_{eff} = \vec{I}_{eff1} + \vec{I}_{eff2}$$

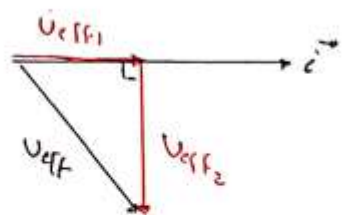
$$I_{eff}^2 = I_{eff1}^2 + I_{eff2}^2 = 16 + 9 = 25$$

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

$$\cos \phi = \frac{P_{avg}}{U_{eff} \cdot I_{eff}} = \frac{240}{60 \times 5} = \frac{4}{5} = 0.8$$

الجواب (D)

(24) اعتماداً على إشارات فرسيف



$$\vec{U}_{eff} = \vec{U}_{eff1} + \vec{U}_{eff2}$$

$$U_{eff}^2 = U_{eff1}^2 + U_{eff2}^2$$

$$(50)^2 = (30)^2 + U_{eff2}^2 \Rightarrow U_{eff2}^2 = 2500 - 900$$

$$U_{eff2}^2 = (600) \Rightarrow U_{eff2} = 40V$$

$$U_{eff2} = X_c I_{eff} \Rightarrow 40 = 20 I_{eff}$$

$$I_{eff} = \frac{40}{20} = 2A \Rightarrow U_{eff1} = R I_{eff}$$

$$30 = R(2) \Rightarrow R = \frac{30}{2} = 15 \Omega$$

$$Z = \sqrt{R^2 + X_c^2} = \sqrt{(15)^2 + (20)^2}$$

$$Z = \sqrt{225 + 400} = \sqrt{625} = 25 \Omega$$

$$\cos \phi = \frac{R}{Z} = \frac{15}{25} = \frac{3}{5} = 0.6$$

الجواب (C)

$$Z = \sqrt{R^2 + (\omega L - \frac{1}{\omega C})^2} \quad (21)$$

$$Z = \sqrt{(30)^2 + (100\pi \times \frac{1}{\pi} - \frac{1}{100\pi \times \frac{1}{6000\pi}})^2}$$

$$Z = \sqrt{900 + 1600} = \sqrt{2500} = 50 \Omega$$

$$U_{eff} = Z I_{eff} \Rightarrow 50 = 50 I_{eff} \Rightarrow$$

$$I_{eff} = 1A \quad \cos \phi = \frac{R}{Z} = \frac{30}{50} = \frac{3}{5}$$

$$\Rightarrow P_{avg} = U_{eff} I_{eff} \cos \phi$$

$$= 50 \times 1 \times \frac{3}{5} = 30W$$

الجواب (D)

$$X_L = X_C \quad \text{عند طين كهرلاني} \quad (22)$$

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

$$C_{eq} = \frac{1}{100\pi \cdot 100\pi \times \frac{1}{\pi}} = \frac{1}{10000\pi} F$$

الوصلة على التوالي

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

$$\frac{1}{C'} = 4000\pi \Rightarrow C' = \frac{1}{4000\pi} F \quad \text{الجواب (A)}$$

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(23)

$$P_{avg} = P_{avg1} + P_{avg2}$$

$$= U_{eff} I_{eff1} \cos \phi_1 + 0$$

$$= 60 \times 4 \times 1 + 0 = 240W$$

منب إحصاءاً على إشارات فرسيف:

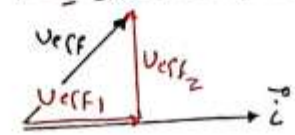
(25)

$$V_{eff,2} = X_L I_{eff} \Rightarrow \omega L I_{eff}$$

$$4 = 100\pi \times \frac{1}{\pi} I_{eff} \Rightarrow I_{eff} = 0.04 A$$

$$V_{eff,1} = R I_{eff} = 75 \times 0.04 = 3V$$

اعتباراً على الأشارة من قبل:



$$\vec{V}_{eff} = \vec{V}_{eff,1} + \vec{V}_{eff,2}$$

$$V_{eff}^2 = V_{eff,1}^2 + V_{eff,2}^2 = (3)^2 + (4)^2 = 9 + 16$$

$$V_{eff}^2 = 25 \Rightarrow V_{eff} = 5V \quad \text{الجواب (c)}$$

$$Z = \sqrt{R^2 + (\omega L)^2} = \sqrt{(75)^2 + (100\pi \times \frac{1}{\pi})^2} \quad (26)$$

$$Z = \sqrt{5625 + 10000} = \sqrt{15625} = 125 \Omega$$

$$\cos \phi = \frac{R}{Z} = \frac{75}{125} = 0.6 \quad \text{الجواب (c)}$$

(27)

$$V_{eff,1} = R I_{eff} = 100 \times 11 = 1100V$$

$$V_{eff,2} = X_L I_{eff} = \omega L I_{eff} = 100\pi \times \frac{1}{\pi} \times 11 = 1100V$$

$$X_L = X_C \quad \text{حالة طنينية كهربائية}$$

$$\frac{1}{\omega C} = X_L \Rightarrow C = \frac{1}{\omega \cdot X_L} = \frac{1}{100\pi \times 10}$$

$$C = \frac{1}{1000\pi} F \quad \text{الجواب (A)}$$

$$X_L = X_C \quad \text{حالة طنينية كهربائية}$$

$$\omega L = \frac{1}{\omega C} \Rightarrow C = \frac{1}{\omega \cdot \omega L}$$

$$C = \frac{1}{100\pi \cdot 100\pi \times \frac{1}{\pi}} = \frac{1}{10000\pi} F \quad \text{الجواب (A)}$$

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(30) حالة طنينية كهربائية

$$V_{eff} = Z I_{eff} = R I_{eff} \Rightarrow 100 = 100 \cdot I_{eff}$$

$$I_{eff} = 1A \quad \text{الجواب (c)}$$

$$P_{avg} = P_{avg,1} + P_{avg,2} \quad (31)$$

$$= V_{eff,1} I_{eff} \cos \phi_1 + 0 \quad (11)$$

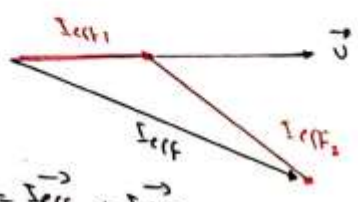
$$V_{eff,1} = R I_{eff} \quad \text{الجواب (c)}$$

$$= 15 \times 4.8 = 72V$$

نوضه به (11)

$$P_{avg} = 72 \times 4.8 \times 1 = 345.6 W$$

(32)



$$\vec{I}_{eff} = \vec{I}_{eff,1} + \vec{I}_{eff,2}$$

$$I_{eff}^2 = I_{eff,1}^2 + I_{eff,2}^2 + 2 I_{eff,1} I_{eff,2} \cos(\phi_2 - \phi_1)$$

$$= 36 + 100 + 2(6)(10)(0.5) = 196$$

$$I_{eff} = 14A \quad \text{الجواب (b)}$$

(33)

$$V_{eff} = R I_{eff,1} \Rightarrow 60 = R(4) \Rightarrow$$

$$R = \frac{60}{4} = 15 \Omega$$

$$V_{eff} = X_L I_{eff,2} = \omega L I_{eff,2}$$

$$60 = 100\pi L(3) \Rightarrow L = \frac{60}{3000\pi}$$

$$L = \frac{1}{5\pi} H \quad \text{الجواب (A)}$$

$$X_L = X_C \quad \text{حالة طنينية كهربائية}$$

$$\omega L = \frac{1}{\omega C} \Rightarrow C = \frac{1}{\omega \cdot \omega L} = \frac{1}{100\pi \cdot 8}$$

$$C = \frac{1}{800\pi} F$$

$$X_C = \frac{1}{\omega C} \Rightarrow C = \frac{1}{X_C \cdot \omega} = \frac{1}{4 \cdot 100\pi} = \frac{1}{400\pi} F$$

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(19) حالة طنين في الدارة

$$X_L = X_C$$

$$\omega' L = \frac{1}{\omega' C} \Rightarrow$$

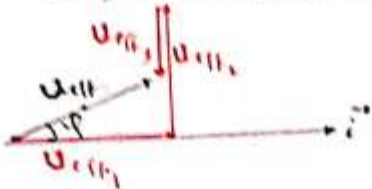
$$\omega' = \frac{1}{L C} \Rightarrow \omega' = \frac{1}{\sqrt{L C}} \Rightarrow 2\pi f' = \frac{1}{\sqrt{L C}}$$

$$f' = \frac{1}{2\pi \sqrt{L C}} = \frac{1}{2\pi \sqrt{\frac{1}{100} \times \frac{1}{40000}}}$$

$$f' = \frac{1}{2\pi \sqrt{\frac{1}{40000}}} = \frac{100}{2} = 50 \text{ Hz}$$

الجواب (A)

(18) افتقاراً على أساس فريزلي:



$$\cos \varphi = \frac{U_{eff1}}{U_{eff}} \quad (1)$$

عنه U_{eff}

$$U_{eff}^2 = U_{eff1}^2 + (U_{eff2} - U_{eff1})^2$$

$$= 900 + 1600 = 2500 \Rightarrow U_{eff} = 50V$$

$$\Rightarrow \cos \varphi = \frac{30}{50} = \frac{3}{5} = 0.6 \quad \text{الجواب (C)}$$

(39)

$$U_{eff2} = X_L I_{eff} = \omega L I_{eff}$$

$$40 = 100\pi \times \frac{4}{5\pi} I_{eff} \Rightarrow 40 = 80 I_{eff}$$

$$I_{eff} = \frac{40}{80} = 0.5 A$$

$$U_{eff1} = R I_{eff} = 60 \times 0.5 = 30V$$

$$P_{avg} = P_{avg1} + P_{avg2}$$

$$= U_{eff1} I_{eff} \cos \varphi_1 + 0$$

$$= 30 \times 0.5 \times 1 = 15 W \quad \text{الجواب (E)}$$

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الوصل المتكافئ

$$\frac{1}{C_{eq}} = \frac{1}{C} + \frac{1}{C'} \Rightarrow 8000\pi = 4000\pi + \frac{1}{C'}$$

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

الجواب (D)

$$I_{eff} = I_{eff}$$

$$\frac{U_{eff}}{Z} = \frac{U_{eff}}{Z'} \Rightarrow Z = Z'$$

(35)

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

$$\omega L = \left(\begin{array}{l} +(\omega L - \frac{1}{\omega C}) \\ -(\omega L - \frac{1}{\omega C}) \end{array} \right)$$

$$\text{لذا } \omega L = \omega L - \frac{1}{\omega C} \Rightarrow \frac{1}{\omega C} = 0 \Rightarrow C = \frac{1}{\omega \times 0}$$

$$C = \infty \quad \text{مكثف مفتوح}$$

$$\text{أو } \omega L = -\omega L + \frac{1}{\omega C} \Rightarrow \frac{1}{\omega C} = 2\omega L$$

$$C = \frac{1}{\omega \cdot 2\omega L} = \frac{1}{100\pi \times 2 \times 100\pi \times \frac{1}{25\pi}}$$

$$C = \frac{1}{8000\pi} \text{ ف}$$

الجواب (D)

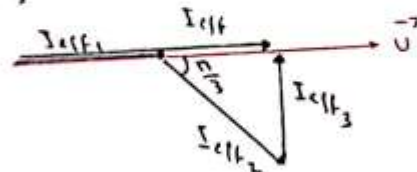
(36)

$$U_{eff3} = X_C I_{eff3} = \frac{1}{\omega C} I_{eff3} \quad (*)$$

اعتماداً على أساس فريزلي:

$$\cos \varphi_2 = 0.5 \Rightarrow$$

$$\varphi_2 = -\frac{\pi}{3} \text{ rad}$$



$$I_{eff3} = I_{eff2} \sin \frac{\pi}{3} = 9 \cdot \frac{\sqrt{3}}{2} = 4.5\sqrt{3} A$$

منه (**)

$$90 = \frac{1}{100\pi C} \cdot 4.5\sqrt{3} \Rightarrow$$

$$C = \frac{4.5\sqrt{3}}{9000\pi} = \frac{\sqrt{3}}{2000\pi} \text{ ف}$$

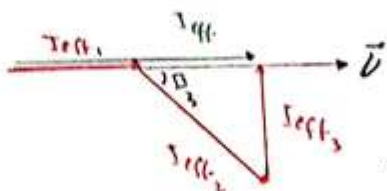
الجواب (D)

16

$$V_{eff3} = X_C I_{eff3} = \frac{1}{\omega C} I_{eff3} \quad (43)$$

اعتماداً على إشارات زمنية:

$$\varphi_2 = -\frac{\pi}{3} \text{ rad}$$



$$I_{eff3} = I_{eff2} \sin \frac{\pi}{3} = 10 \times \frac{\sqrt{3}}{2} = 5\sqrt{3} \text{ A}$$

فرض ب (x):

$$130 = \frac{1}{1000\pi C} \cdot 5\sqrt{3} \Rightarrow C = \frac{5\sqrt{3}}{13000\pi}$$

$$C = \frac{\sqrt{3}}{1600\pi} \text{ F} \quad \text{الجواب (c)}$$

اعتماداً على إشارات زمنية:

$$V_{eff}^2 = V_{eff1}^2 + V_{eff2}^2$$

$$(100)^2 = (60)^2 + V_{eff2}^2 \Rightarrow$$

$$V_{eff2}^2 = 10000 - 3600 = 6400 \Rightarrow$$

$$V_{eff2} = 80 \text{ V} \Rightarrow V_{eff2} = X_C I_{eff}$$

$$V_{eff2} = \frac{1}{\omega C} I_{eff} \Rightarrow 80 = \frac{1}{1000\pi \times \frac{1}{4000\pi}} I_{eff}$$

$$80 = 40 I_{eff} \Rightarrow I_{eff} = \frac{80}{40} = 2 \text{ A}$$

$$V_{eff1} = R I_{eff} \Rightarrow 60 = R(2)$$

$$R = \frac{60}{2} = 30 \Omega \quad \text{الجواب (d)}$$

لمية الحرارة التي يكتسبها = لمية الطاقة الكهربائية التي تنفذها المقاومة
الماء البارد .

$$\frac{80}{100} R I_{eff}^2 dt = m C_0 \Delta t$$

$$0.8 \frac{V_{eff}}{I_{eff}} I_{eff}^2 \cdot dt = m C_0 \Delta t$$

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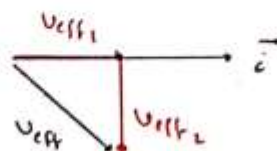
40 حالة طينية كبريتية

$$V_{eff} = 2 I_{eff} = R I_{eff}$$

$$40 = 20 I_{eff} \Rightarrow I_{eff} = \frac{40}{20} = 2 \text{ A}$$

الجواب (A)

اعتماداً على إشارات زمنية:



$$\vec{V}_{eff} = \vec{V}_{eff1} + \vec{V}_{eff2}$$

$$V_{eff}^2 = V_{eff1}^2 + V_{eff2}^2 \Rightarrow (50)^2 = (30)^2 + V_{eff2}^2$$

$$V_{eff2}^2 = 2500 - 900 = 1600 \Rightarrow V_{eff2} = 40 \text{ V}$$

$$V_{eff2} = X_C I_{eff} \Rightarrow 40 = 20 I_{eff} \Rightarrow I_{eff} = \frac{40}{20} = 2 \text{ A}$$

$$P_{avg} = P_{avg1} + P_{avg2} = V_{eff1} I_{eff} \cos \varphi_1 + 0$$

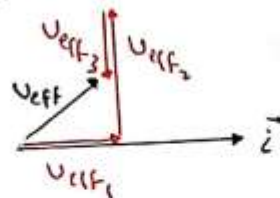
$$P_{avg} = 30 \times 2 \times 1 = 60 \text{ W} \quad \text{الجواب (b)}$$

$$V_{eff2} = X_C I_{eff} = \frac{1}{\omega C} I_{eff} \quad (42)$$

$$40 = \frac{1}{1000\pi \times \frac{1}{2000\pi}} I_{eff} \Rightarrow 40 = 20 I_{eff}$$

$$I_{eff} = \frac{40}{20} = 2 \text{ A}$$

حساب V_{eff} اعتماداً على إشارات زمنية:



$$V_{eff}^2 = V_{eff1}^2 + (V_{eff2} - V_{eff3})^2 = 900 + 1600 = 2500$$

$$V_{eff} = 50 \text{ V}$$

$$V_{eff} = Z I_{eff} \Rightarrow 50 = Z(2) \Rightarrow Z = \frac{50}{2}$$

$$Z = 25 \Omega \quad \text{الجواب (d)}$$

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

$$= U_{eff} I_{eff_1} \cos \varphi_1 + P_{avg_2}$$

$$= 120 \times 6 \times 1 + 600$$

$$P_{avg} = 1320 \text{ W} \Rightarrow$$

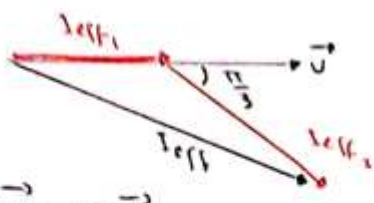
سبب I_{eff_1}

$$P_{avg_2} = U_{eff} I_{eff_2} \cos \varphi_2$$

$$600 = 120 \cdot I_{eff_2} \cdot \frac{1}{2} \Rightarrow$$

$$I_{eff_2} = \frac{600}{60} = 10 \text{ A}$$

سبب I_{eff} : من اشتراط تربط



$$\vec{I}_{eff} = \vec{I}_{eff_1} + \vec{I}_{eff_2}$$

$$I_{eff}^2 = I_{eff_1}^2 + I_{eff_2}^2 + 2 I_{eff_1} I_{eff_2} \cos(\frac{\pi}{3})$$

$$I_{eff}^2 = 36 + 100 + 2(6)(10)(\frac{1}{2}) = 196$$

$$I_{eff} = 14 \text{ A} \Rightarrow$$

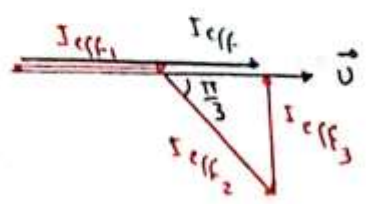
$$\cos \varphi = \frac{P_{avg}}{U_{eff} \cdot I_{eff}} = \frac{1320}{120 \times 14}$$

$$\cos \varphi = 0.78 \quad \text{الجواب (C)}$$

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$$U_{eff} = X_C I_{eff_2} = \frac{1}{\omega C} I_{eff_2}$$

سبب I_{eff_2} اعتباراً على اشتراط تربط



$$I_{eff_2} = I_{eff} \sin \frac{\pi}{3} \quad \dots (2)$$

$$0.8 U_{eff} I_{eff} dt = m C_0 \Delta t \Rightarrow$$

$$I_{eff} = \frac{m C_0 \Delta t}{0.8 U_{eff} \cdot dt} = \frac{1 \times 4200 \times 80}{0.8 \times 120 \times 12 \times 60}$$

$$I_{eff} = \frac{336000}{6720} = 4.86 \text{ A}$$

$$P_{avg} = U_{eff} I_{eff} \cos \varphi \quad (46)$$

$$\cos \varphi_2 = \frac{R'}{Z_2} = \frac{R'}{\sqrt{R'^2 + (\omega L)^2}}$$

$$0.6 = \frac{R'}{\sqrt{R'^2 + 900}} \Rightarrow 0.36 = \frac{R'^2}{R'^2 + 900}$$

$$R'^2 = 0.36 R'^2 + 324 \Rightarrow 0.64 R'^2 = 324$$

$$R'^2 = \frac{324}{0.64} = 506.25 \Rightarrow R' = 22.5 \Omega$$

$$Z_{كلية} = \sqrt{(R' + R)^2 + (\omega L)^2} = \sqrt{(22.5 + 17.5)^2 + 900}$$

$$Z_{كلية} = \sqrt{1600 + 900} = \sqrt{2500} = 50 \Omega$$

$$U_{eff} = Z I_{eff} = 50 \times 3 = 150 \text{ V}$$

$$\cos \varphi = \frac{R + R'}{Z} = \frac{40}{50} = \frac{4}{5} = 0.8$$

$$\Rightarrow P_{avg} = 150 \times 3 \times \frac{4}{5} = 360 \text{ W} \quad \text{الجواب (D)}$$

47

لتيه الحرارة التي يكتبها = لتيه لطاثة الحرارة التي تنشأها المقارنة الماس البارد

$$R I_{eff}^2 dt = m C_0 \Delta t$$

تغير درجة حرارة

$$\frac{U_{eff}}{I_{eff}} \cdot I_{eff}^2 dt = m C_0 \Delta t \Rightarrow$$

$$I_{eff} = \frac{m C_0 \Delta t}{U_{eff} \cdot dt} = \frac{1 \times 4200 \times 72}{120 \times 7 \times 60}$$

$$I_{eff} = 6 \text{ A}$$

18

(50)

$I_{eff} = I'_{eff}$
 ببداهة صانعة - ببداهة صانعة
 $\frac{V_{eff}}{Z} = \frac{V_{eff}}{Z'} \Rightarrow Z = Z'$

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

$\omega L = \begin{cases} + (\omega L - \frac{1}{\omega C}) \\ - (\omega L - \frac{1}{\omega C}) \end{cases}$

أو $\omega L = \omega L - \frac{1}{\omega C} \Rightarrow \frac{1}{\omega C} = 0 \Rightarrow$

$C = \frac{1}{\omega \times 0} = \infty$ حله رنرض

أو $\omega L = -\omega L + \frac{1}{\omega C} \Rightarrow \frac{1}{\omega C} = 2\omega L$

$C = \frac{1}{2\omega L \cdot \omega} = \frac{1}{2 \times 70 \times 100\pi}$

$C = \frac{1}{6000\pi} \text{ f}$ الجواب (D)

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$P_{avg_2} = V_{eff} I_{eff_2} \cos \phi_2$

$600 = 120 \times I_{eff_2} \times \frac{1}{2}$

$\Rightarrow I_{eff_2} = \frac{600}{60} = 10 \text{ A}$

نفوض ب (2):

$I_{eff_3} = 10 \times \frac{\sqrt{3}}{2} = 5\sqrt{3} \text{ A}$

نفوض ب (1):

$120 = \frac{1}{100\pi C} \cdot 5\sqrt{3} \Rightarrow$

$C = \frac{5\sqrt{3}}{12000\pi} = \frac{\sqrt{3}}{2400\pi} \text{ f}$ الجواب (A)

(49)

(1) - $V_{eff} = X_L I_{eff_3} = \omega L I_{eff_3}$

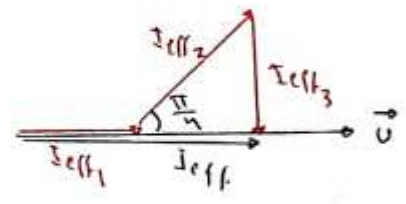
مكتب I_{eff_3} اعتماداً على ωL و I_{eff_3}
 لذا يتوجب معرفة ϕ_2 :

$V_{eff_2} = Z_2 I_{eff_2} \Rightarrow 100 = Z_2 \sqrt{2}$

$Z_2 = \frac{100}{\sqrt{2}} = 50\sqrt{2} \Omega$

$\cos \phi_2 = \frac{R}{Z_2} = \frac{50}{50\sqrt{2}} = \frac{1}{\sqrt{2}} \Rightarrow$

$\phi_2 = + \frac{\pi}{4} \text{ rad}$



$I_{eff_3} = I_{eff_2} \sin \frac{\pi}{4} = \sqrt{2} \times \frac{1}{\sqrt{2}} = 1 \text{ A}$

نفوض ب (1):

$100 = 100\pi L (1) \Rightarrow L = \frac{100}{100\pi} = \frac{1}{\pi} \text{ H}$

الجواب (B)