

總	分

答案

一、單選題 (33 題 每題 3 分最後 1 題 4 分 共 100 分)

- 1.B 2.D 3.B 4.C 5.B 6.C 7.D 8.A 9.A 10.B 11.C 12.A 13.C 14.C 15.C 16.A 17.C 18.A 19.D 20.D 21.A 22.D 23.C
24.A 25.B 26.D 27.B 28.B 29.D 30.B 31.D 32.C 33.A

解析

一、單選題 (33 題 每題 3 分 共 99 分)

1. $e = B\ell v \sin \theta = 4 \times 100 \times 10^{-2} \times 5 \times \sin(90^\circ - 60^\circ)$

$= 10V$ (θ : 導線運動方向與磁場方向之夾角)

3. $R_{ab} = (2+2) + 3 // R_{ab} = 4 + \frac{3R_{ab}}{3+R_{ab}}$ $R_{ab}(3+R_{ab}) = 4(3+R_{ab}) + 3R_{ab}$

$R_{ab}^2 - 4R_{ab} - 12 = 0$ $(R_{ab} - 6)(R_{ab} + 2) = 0$ $\therefore R_{ab} = 6\Omega$

5. $\bar{Z}_T = R + j(X_L - X_C) = 10 + j(10 - 20) = 10 - j10 = 10\sqrt{2} \angle -45^\circ \Omega$

7. 平均值 $\frac{\Sigma A}{T} = \frac{(-4 \times 2) + (8 \times 2) + (2 \times 2)}{8} = 1.5V$

有效值 $= \sqrt{\frac{\Sigma(V_{rms}^2 \times t)}{T}} = \sqrt{\frac{(-4)^2 \times 2 + 8^2 \times 2 + 2^2 \times 2}{8}} = 4.6V$

8. $V_{rms} = \sqrt{\frac{7^2 \times 1 + (-\sqrt{5})^2 \times 1}{3}} = \sqrt{\frac{49+5}{3}} = \sqrt{18} = 3\sqrt{2}V$

9. $\alpha_1 = \frac{R_2 - R_1}{t_2 - t_1} \times \frac{1}{R_1} = \frac{3-2}{20-10} \times \frac{1}{2} = 0.05$

10. $C = 10 \times 10^3 pF \pm 5\% = 10nF \pm 5\%$

11. $W_L = \frac{1}{2} L \times I^2$;

$L = N \times \frac{\phi}{I} = 3000 \times \frac{2 \times 10^{-3}}{10} = 0.6H$

$\therefore W_L = \frac{1}{2} \times 0.6 \times 10^2 = 30J$

12. $X_{Lo} = \omega_o L = 1000 \times 2 \times 10^{-3} = 2$ $Q_s = \frac{X_{Lo}}{R} = \frac{2}{10} = \frac{1}{5}$ $V_{Lo} = Q_s V_m = \frac{1}{5} \times 200 = 40V$

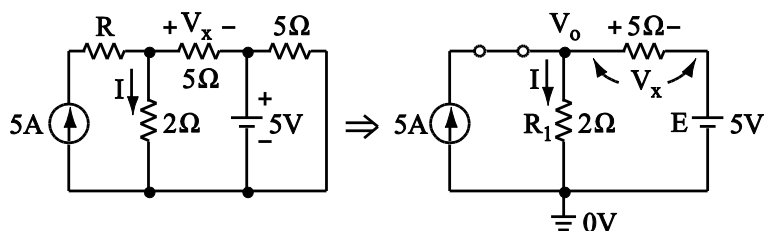
13. $P_{max} = P + S = EI(\cos\theta + 1) = 100 \times I(1 + 1) = 2000W$, $\sqrt{2} I = I_m$

14. $V_m = \frac{V_{p-p}}{2} = \frac{440}{2} = 220V$ $V_{rms} = \sqrt{\frac{(\frac{220}{\sqrt{2}})^2 \times \pi}{\pi}} = \frac{220}{\sqrt{2}} = 110\sqrt{2}V \approx 156V$

15. $\therefore L = \frac{N^2}{R} = \frac{\mu AN^2}{\ell} \propto N^2$ $\therefore N' = N \times \sqrt{\frac{L'}{L}} = 22 \times \sqrt{\frac{480\mu}{120\mu}} = 44$ 匝

16. 利用密爾門定理： $V_o = (5 + \frac{5}{5}) \times (2 // 5) = \frac{60}{7} V$

$I = \frac{\frac{60}{7} - 0}{2} = \frac{30}{7} A$ $V_x = \frac{60}{7} - 5 = \frac{25}{7} V$



18. $P = V \times I = 5 \times 3 = 15 \text{ W}$

電流由高電位流入，故為消耗功率

19. $L_T = \frac{L_A \times L_B - M^2}{L_A + L_B + 2M} = \frac{10^{-2} \times 2 \times 10^{-2} - (10^{-3})^2}{10^{-2} + 2 \times 10^{-2} + 2 \times 10^{-3}} = 6.2 \times 10^{-3} \text{ H}$

20. $E = 5 \times 10^4 \text{ NT/C}$ [1庫侖受力 5×10^4 牛頓]

$F = q \times E = 6 \times 10^{-5} \times 5 \times 10^4 = 30 \times 10^{-1} = 3 \text{ NT}$

21. 根據楞次定律，其應電勢上端為低電位，與圖示相反，故取負值，再依據法拉第感應定律可得

$e = - \left| N \frac{\Delta \phi}{\Delta t} \right| = - \left| 100 \times \frac{0.4 - 0.8}{0.2} \right| = - 200 \text{ V}$

24. $\frac{P_{\text{甲}}}{P_{\text{乙}}} = \frac{\frac{V^2}{R_{\text{甲}}}}{\frac{V^2}{R_{\text{乙}}}} = \frac{R_{\text{乙}}}{R_{\text{甲}}}$

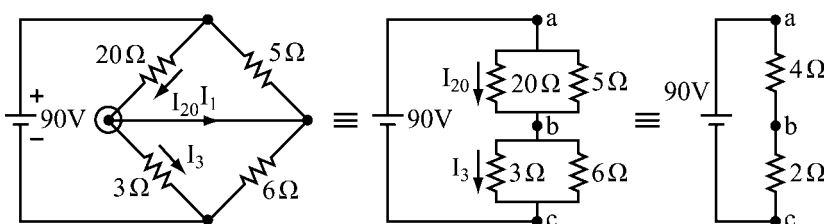
$\frac{R_{\text{乙}}}{R_{\text{甲}}} = \frac{\rho \times \frac{6}{4}}{\rho \times \frac{3}{1}} = \frac{1}{2}$

$\therefore \frac{P_{\text{甲}}}{P_{\text{乙}}} = \frac{R_{\text{乙}}}{R_{\text{甲}}} = \frac{1}{2}$

25. $R = \frac{E^2}{P} = \frac{220^2}{4000} = 12.1 \Omega$ $R' = \frac{R'}{1} = 1 \times \frac{4}{5} = \frac{4}{5} \Omega$

$P' = \frac{E'^2}{R'} = \frac{110^2}{9.68} = 1250 \text{ W}$

26.



(1) 流入 = 流出

$I_{20} = I_3 + I_1$

$\therefore I_1 = I_{20} - I_3$

(2) $\therefore V_{ab} = \frac{90}{4+2} \times 4 = 60 \text{ V}$

$V_{bc} = \frac{90}{4+2} \times 2 = 30 \text{ V}$

$\therefore I_{20} = \frac{V_{ab}}{20} = \frac{60}{20} = 3 \text{ A}$

$I_3 = \frac{V_{bc}}{3} = \frac{30}{3} = 10 \text{ A}$

$\Rightarrow I_1 = I_{20} - I_3 = 3 - 10 = -7 \text{ A}$

$$28. X_L = \omega L = 100 \times 50\text{m} = 5\Omega \quad X_C = \frac{1}{\omega C} = \frac{1}{100 \times 1\text{m}} = 10\Omega$$

$$Z = R // jX_L // -jX_C = 10 // j5 // -j10 = 5\sqrt{2} \angle 45^\circ \Omega$$

$$\text{PF} = \cos(+45^\circ) = \frac{1}{\sqrt{2}} = 0.707$$

$$30. \bar{Z}_N = j8 - j6 = j2 \quad ,$$

$$I_N = \frac{-j6}{j8 - j6} \times 10 \angle 0^\circ = 30 \angle 180^\circ \text{A} \quad ,$$

$$I = \frac{j2}{2 + j2} \times 30 \angle 180^\circ = 15\sqrt{2} \angle -135^\circ \text{A}$$

32. 電容串聯分壓定則：

$$V_{C_1} = E \times \frac{C_2}{C_1 + C_2} \quad V_{C_2} = E \times \frac{C_1}{C_1 + C_2} = 100 \times \frac{6}{6+3} = 66.6 \text{ V}$$

33. 密爾門定理

$$V = \frac{\frac{0}{8} + \frac{25}{2} + \frac{6}{4}}{\frac{1}{8} + \frac{1}{2} + \frac{1}{4}} = 16\text{V} = V_1$$