九十九學年四技二專第四次聯合模擬考試
電機與電子群　專業科目（一）　詳解

99-4-03-4
99-4-04-4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
D	C	C	B	A	D	A	B	A	B	C	D	D	B	A	C	B	C	A	D	D	A	B	D	C
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
C	B	A	C	B	A	D	B	D	A	C	D	A	C	C	B	D	D	C	C	A	B	B	D	B

第一部份：基本電學

1. 已知 $H = ms\Delta T = 0.24\,Pt = 0.24\,I^2Rt$

   其中 $m = 1000\text{ g}$，$S = 1$ 卡$/\text{g}\cdot°\text{C}$，$I = 5\text{ A}$，$R = 50\,\Omega$

   $\Delta T = 32°\text{C} - 20°\text{C} = 12°\text{C}$

   $\therefore t = \dfrac{ms\Delta T}{0.24\,I^2R} = \dfrac{1000\text{ g}\times 1\text{卡/g}\times 12°\text{C}}{0.24\times(5\text{A})^2\times 50\,\Omega} = 40$ 秒

2. 已知 $R_2 = R_1[1+\alpha_1(T_2 - T_1)]$

   其中 $R_1 = 50\,\Omega$，$\alpha_1 = \alpha_{20} = \dfrac{0.005}{°\text{C}}$

   $T_2 = 60°\text{C}$，$T_1 = 20°\text{C}$

   $\therefore R_2 = 50\,\Omega\times[1+\dfrac{0.005}{°\text{C}}\times(60°\text{C} - 20°\text{C})]$

   $= 50\,\Omega\times[1+\dfrac{0.005}{°\text{C}}\times 40°\text{C}]$

   $= 50\,\Omega\times[1+0.2] = 50\,\Omega\times 1.2 = 60\,\Omega$

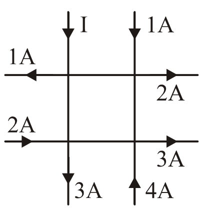
3. 因三者為並聯，所以 2 A 電流源及 5 Ω 電阻器之兩端電壓皆為 5 V，所以 $I_2 = \dfrac{5\text{ V}}{5\,\Omega} = 1\text{ A}$

   $P_{5\Omega} = I_2{}^2R = (1\text{ A})^2\times 5\,\Omega = 5\text{ W}$ (消耗)

   $P_{2A} = IE = 2\text{ A}\times 5\text{ V} = 10\text{ W}$ (提供)

   $P_{5V} = I_1\cdot E = (2\text{ A} - 1\text{ A})\times 5\text{ V} = 1\text{ A}\times 5\text{ V} = 5\text{ W}$ (消耗)

4. 將已知電壓 ÷ 電阻得到電流如右圖，利用流入總電流 = 流出總電流即可得

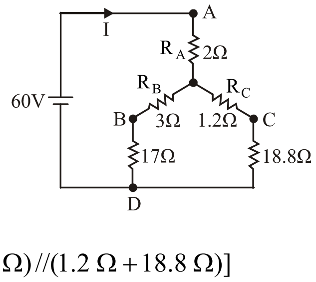
   

   $I_{流入} = 1\text{ A} + 4\text{ A} + 2\text{ A} + I = 7\text{ A} + I$

   $I_{流出} = 2\text{ A} + 3\text{ A} + 3\text{ A} + 1\text{ A} = 9\text{ A}$

   $\therefore I = 9\text{ A} - 7\text{ A} = 2\text{ A}$

5. 藍黑金金 $= 6\,\Omega\pm 5\%$ (以 6 Ω 計算)，再利用 $\Delta\rightarrow Y$ 得到右圖

   $R_A = \dfrac{10\times 4}{10+6+4} = 2\,\Omega$

   $R_B = \dfrac{10\times 6}{10+6+4} = 3\,\Omega$

   $R_C = \dfrac{6\times 4}{10+6+4} = 1.2\,\Omega$

   $\therefore R_{AD} = 2\,\Omega + [(3\,\Omega + 17\,\Omega)//(1.2\,\Omega + 18.8\,\Omega)]$

   $= 2\,\Omega + [20\,\Omega // 20\,\Omega] = 2\,\Omega + 10\,\Omega = 12\,\Omega$

   $I = \dfrac{60\text{ V}}{12\,\Omega} = 5\text{ A}$

6. $\because V_B = 24\text{ V}\times\dfrac{2\,\Omega}{2\,\Omega + 2\,\Omega} = 12\text{ V}$，$V_C = 12\text{ V}$

   $V_B = V_C$ (平衡)，∴R 值不論為何值，I 值均保持固定 (不變)

7. 設 I_1 為單一電流，且利用電橋平衡法

   $(V_{BE} = V_{EG} = 0\text{ V})$

   可得 $V_{DF} = (10+10+10+10)\times I_1 = 40\,I_1$

   $\therefore I_2 = \dfrac{V_{DF}}{10+10} = \dfrac{40\,I_1}{20} = 2\,I_1$，又得

   $V_{AC} = 10\,\Omega(I_1 + I_2) + V_{DF} + 10\,\Omega(I_1 + I_2)$

   $= 30\,I_1 + 40\,I_1 + 30\,I_1 = 100\,I_1$

   $\therefore I_3 = \dfrac{V_{AC}}{10+10} = \dfrac{100\,I_1}{20} = 5\,I_1$

   故 $I_1 : I_2 : I_3 = I_1 : 2\,I_1 : 5\,I_1 = 1 : 2 : 5$

8. (1) 當 VR = 0 Ω 時，電路如圖(一)所示

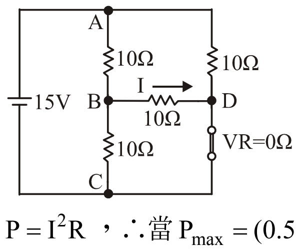
   $I = \dfrac{15\text{ V}}{10+(10//10)}\times\dfrac{10}{10+10} = 0.5\text{ A}$

   (2) 當 VR = ∞ 時，電路如圖(二)所示

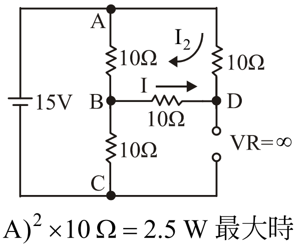
   $I = -I_2 = -[\dfrac{15\text{ V}}{10+(10//(10+10))}]\times\dfrac{10}{10+(10+10)} = -0.3\text{ A}$

   故 I 值由 −0.3 A ~ +0.5 A 變化

   圖(一)

   圖(二)

9. $P = I^2R$，∴當 $P_{max} = (0.5\text{ A})^2\times 10\,\Omega = 2.5\text{ W}$ 最大時 VR = 0 Ω (注意題目的陷阱)

10. ∵S 閉合前 V_1 與 V_2 極性相反

    ∴閉合後 $V_1 = -V_2 = \dfrac{Q_1 - Q_2}{C_1 + C_2} = \dfrac{10\,\mu\text{C} - 20\,\mu\text{C}}{10\,\mu\text{F} + 10\,\mu\text{F}}$

    $= \dfrac{-10\,\mu\text{C}}{20\,\mu\text{F}} = -0.5\text{ V}$

11. $\because e = M\dfrac{\Delta I}{\Delta t}$，$\therefore M = e\dfrac{\Delta t}{\Delta I} = 60\ V \times \dfrac{1\ mS}{2\ A} = 30\ mH$

12. 此爲兩電感並聯互消連結

故 $L_T = \dfrac{L_1L_2 - M^2}{L_1 + L_2 + 2M} = \dfrac{3\times 6 - 1^2}{3+6+2} = \dfrac{17}{11}\ H$

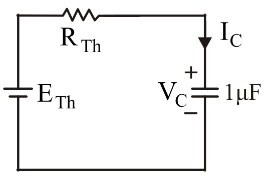
13. (1) S 閉合時，$R_{Th} = 500\ k\Omega // 500\ k\Omega = 250\ k\Omega$

$E_{Th} = 10\ V \times \dfrac{500\ k\Omega}{500\ k\Omega + 500\ k\Omega} = 5\ V$

$\tau = R_{Th}\cdot C = 250\ k\Omega \times 1\ \mu F = 250\ mS = 0.25\ S$

(2) $I_C = \dfrac{E_{Th}}{R_{Th}} \times e^{-\frac{t}{\tau}} = \dfrac{5\ V}{250\ k\Omega} \times e^{-\frac{1\ S}{0.25\ S}}$

$= 0.02\ mA \times 0.02 = 0.4\ \mu A$



(3) $V_C = E_{Th}(1 - e^{-\frac{t}{\tau}})$

$= 5\ V \times (1 - e^{-\frac{1\ S}{0.25\ S}})$

$= 5\ V \times 0.98 = 4.9\ V$

14. (1) $\tau_{充電} = \dfrac{L}{R_1} = \dfrac{6\ H}{2\ k\Omega} = 3\ mS$，$1\ S >> 5\ \tau_{充電}$

應爲充電穩態後，$\therefore V_{L(1\ S)} = 0\ V$

$I_{L(1\ S)} = \dfrac{E - V_{L(1\ S)}}{R_1} = \dfrac{50\ V - 0\ V}{2\ k\Omega} = 25\ mA$

$\Rightarrow$ 視爲下次放電電流的初值 $I_{L(o)}$

(2) $\tau_{放電} = \dfrac{L}{R_2} = \dfrac{6\ H}{6\ k\Omega} = 1\ mS$

(A) 選項錯誤 $\Rightarrow$ 視爲 $\tau = \tau_{放電} = 1\ mS$

(3) $V_2 = V_L = -I_{L(o)} \times R_2 \times e^{-\frac{t}{\tau}}$

$= -25\ mA \times 6\ k\Omega \times e^{-\frac{1\ mS}{1\ mS}} = -150\ V \times 0.368 = -55.2\ V$

(4) $I_L = I_{L(o)} \times e^{-\frac{t}{\tau}} = 25\ mA \times e^{-\frac{1\ mS}{1\ mS}}$

$= 25\ mA \times 0.368 = 9.2\ mA$，

15. 已知 $f = \dfrac{P}{2} \times \dfrac{N}{60}$ (P 爲極數，N 爲每分鐘轉速)

且 $P = 40$，$f = 60$，$\therefore N = \dfrac{120f}{P} = \dfrac{120\times 60}{40} = 180\ rpm$

(每分鐘 180 轉)，$N' = \dfrac{N}{60} = \dfrac{180}{60} = 3\ rps$

16. (C) 互調，$CF = \sqrt{3}$，$FF = \dfrac{2}{\sqrt{3}}$

17. (A) $\vec{Z} = R + jX_L - jX_C$ (串聯公式)

$= 30 - j40\ \Omega = 50\angle -53°\ \Omega$

(B) $\vec{i} = \dfrac{v(t)}{\vec{Z}} = \dfrac{\frac{100\sqrt{2}}{\sqrt{2}}\angle 30°}{50\angle -53°} = 2\angle 83°\ A$

(C) $\vec{V_R} = \vec{i}\cdot\vec{R} = 2\angle 83° \times 30\angle 0° = 60\angle 83°\ \Omega$

(D) $\vec{V_o} = \vec{i}\cdot\vec{X_C} = 2\angle 83° \times 40\angle -90° = 80\angle -7°\ V$

18. (A) $\because \vec{V} = \vec{V_R} = \vec{V_L} = \vec{I_L} \times \vec{X_L}$

$= 10\angle -90° \times 10\angle 90° = 100\angle 0°$

$\therefore v(t) = 100\sqrt{2}\sin(\omega t + 0°) = 100\sqrt{2}\sin(377t)\ V$

[$\because \omega = 2\pi f = 2\times 3.14\times 60 = 377\ A$]

(B) $\vec{I_R} = \dfrac{\vec{V_R}}{R} = \dfrac{100\angle 0°}{10\angle 0°} = 10\angle 0° \Rightarrow$

$I_R = 10\sqrt{2}\sin(377t + 0°) = 14.14\sin(377t)\ A$

(C) $\vec{I} = \vec{I_R} + \vec{I_L} = 10\angle 0° + 10\angle -90° = 10\sqrt{2}\angle -45°$

$\Rightarrow i(t) = 20\sin(377t - 45°)\ A$

(D) $\vec{Z} = \dfrac{\vec{V}}{\vec{I}} = \dfrac{100\angle 0°}{10\sqrt{2}\angle -45°} = 5\sqrt{2}\angle 45°\ \Omega$

19. (A) $\because \omega = 200$，$\therefore X_L = \omega L = 200 \times 0.8 = 160\ \Omega$

$X_C = \dfrac{1}{\omega C} = \dfrac{1}{200\times 25\times 10^{-6}} = 200\ \Omega$，$\vec{V} = 100\angle 0°$

$\therefore \vec{Z} = R + jX_L - jX_C = 30 + j160 - j200 = 30 - j40\ \Omega$

$= 50\angle -53°$

(B) $\vec{i} = \dfrac{\vec{V}}{\vec{Z}} = \dfrac{100\angle 0°}{50\angle -53°} = 2\angle 53°\ A$

(C) $\vec{V_L} = \vec{i}\cdot\vec{X_L} = 2\angle 53° \times 160\angle 90° = 320\angle 143°\ V$

(D) $\vec{V_C} = \vec{i}\cdot\vec{X_C} = 2\angle 53° \times 200\angle -90° = 400\angle -37°\ V$

20. $\because \vec{V} = \dfrac{100\sqrt{2}}{\sqrt{2}}\angle 30° = 100\angle 30°\ V$

$\vec{I} = \dfrac{10\sqrt{2}}{\sqrt{2}}\angle -30° = 10\angle -30°\ A$

$\therefore$(A) $\vec{S} = \vec{V} \times \vec{I}^* = 100\angle 30° \times (10\angle -30°)^*$

$= 100\angle 30° \times 10\angle 30° = 1000\angle 60°\ VA$

$= 1000(\cos 60° + j\sin 60° = 1000 \times (\dfrac{1}{2} + j\dfrac{\sqrt{3}}{2})$

$= 500 + j500\sqrt{3}$ 伏安

又 $\because \vec{S} = \vec{P} + j\vec{Q} = 500 + j500\sqrt{3}\ VA$

$= 500\ W + j500\sqrt{3}\ VAR$

$\therefore$(B) $P = 500\ W = 500$ 瓦特

(C) $Q = 500\sqrt{3}\ VAR = 500\sqrt{3}$ 乏 (電感性)

(D) $P.F = \dfrac{\bar{P}}{\bar{S}} = \dfrac{500\angle 0°}{1000\angle 60°} = 0.5\angle -60°$ (落後)

21. $\because \vec{Z} = R + jX_L - jX_C = 30 + j60 - j20$

$= 30 + j40 = 50\angle 53°\ \Omega$

$\therefore \vec{i} = \dfrac{\vec{V}}{\vec{Z}} = \dfrac{\frac{1000\sqrt{2}}{\sqrt{2}}\angle 0°}{50\angle 53°\ \Omega} = 2\angle -53°\ A = \vec{I_R} = \vec{I_L} = \vec{I_C}$

(A) $P = I_R^2 R = 2^2 \times 30 = 120\ W$

$Q = I_L^2 X_L - I_C^2 X_C = 2^2 \times 60 - 2^2 \times 20$

$= 240 - 80\ VAR = 160\ VAR$

$S = P + jQ = 120\ W + j160\ VAR = 200\angle 53°\ VA$

(B) $P_{max} = P + S = 120 + 200 = 320\ W$

(C) $P_{min} = P - S = 120 - 200 = -80$ W

(D) $P.F = \frac{P}{S} = \frac{120\angle 0°}{200\angle 53°} = 0.6\angle -53°$ (落後)

22. (A) 電容性 → 電阻性 → 電感性

23. (A) 因諧振條件 $X_L = X_C$ ，$\therefore B_L = B_L$

$\therefore Y = G + j B_C - j B_L = G$ (導納最小)

(B) $\overrightarrow{Z} = \frac{1}{\overrightarrow{Y}}$ (最大)

(C) $\overrightarrow{I} = \frac{\overrightarrow{V}}{\overrightarrow{Z}} = \overrightarrow{V} \cdot \overrightarrow{Y}$ (最小)

(D) $\overrightarrow{V}$保持不變

24. $\overrightarrow{Z_P} = 3 + j\,4\,\Omega = 5\angle 53°\,\Omega$，$V_P = \frac{V_L}{\sqrt{3}} = \frac{220\sqrt{3}}{\sqrt{3}} = 220$ V

$I_P = \frac{V_P}{Z_P} = \frac{220\text{ V}}{5\,\Omega} = 44$ A

$P_P = {I_P}^2 \cdot R_P = (44\text{ A})^2 \times 3\,\Omega = 5808$ W

$P_T = 3\,P_P = 3 \times 5808\text{ W} = 17424$ W

25. (A) $\because V_P = V_L = 100$ V ， $Z_P = 100\,\Omega$

$\therefore I_P = \frac{V_P}{Z_P} = \frac{100\text{ V}}{100\,\Omega} = 1$ A

(B) $P = 3\,I_P V_P \cos\theta = 3 \times 1 \times 100 \times \cos 60°$

$= 300 \times \frac{1}{2} = 150$ W

(C) $Q = 3\,I_P V_P \sin\theta = 3 \times 1 \times 100 \times \sin 60°$

$= 300 \times \frac{\sqrt{3}}{2} = 150\sqrt{3}$ VAR

(D) $S = 3\,I_P V_P = 3 \times 1 \times 100 = 300$ VA

第二部份：電子學

27. $\because V_o = V_Z$ 正常工作不變，$\therefore I_L = \frac{V_o}{R_L}$ 不變

又$\because I_S = \frac{V_S - V_Z}{R_S}$ ，當 R_S 由小變大時，I_S 將由大變小

28. ∵漣波可視爲三角波

$\therefore V_{r(rms)} = \frac{V_{r(pp)}}{2\sqrt{3}} = \frac{6.92\text{ V}}{2\sqrt{3}} ≒ 2$ V

且 $r\% = \frac{V_{r(rms)}}{V_{dc}} \times 100\%$ ，$\therefore r\% = \frac{2\text{ V}}{50\text{ V}} \times 100\% = 4\%$

29. (C) 圖爲倍壓電路

30. 滿足輸出波形不失眞條件爲 $RC \geq 5\,T$

$\therefore 5\,T \leq RC = 2\text{ k}\Omega \times 5\,\mu\text{F} = 10\text{ mS} \Rightarrow T \leq \frac{10\text{ ms}}{5} = 2$ mS

又$\because T \leq 2$ mS ， $T = \frac{1}{f} \leq 2$ mS ，$\therefore f \geq \frac{1}{2\text{ mS}} = 500$ Hz

31. (1) 正半週，D_1 順向導通， $V_i > 3$ V時， D_2 才導通

$V_o = V_i - 3$ V

(2) 負半週，D_2 順向導通， $V_i < -5$ V時，D_1 才導通

$V_o = V_i + 5$ V

32. (A) 減少　(B) 減少　(C) 減少

33. (A) $V_C > V_B > V_E$ 工作於主動模式

(C) $V_E > V_C > V_B$ 或 $V_C > V_E > V_B$ 工作於截止區

(D) $V_E > V_B > V_C$ 工作於反向主動模式

34. (D) $\beta = \frac{I_C}{I_B} \times \frac{I_E}{I_E} = \frac{I_C}{I_E} \times \frac{I_E}{I_B} = \alpha \cdot \gamma$

35. (1) $I_B = \frac{V_{CC} - V_{BE}}{R_B + (1+\beta)R_E} = \frac{12\text{ V} - 0.7\text{ V}}{250\text{ k}\Omega + (1+100) \times 1.5\text{ k}\Omega}$

$= \frac{11.3\text{ V}}{401.5\text{ k}\Omega} \cong 28.25\,\mu$A

(2) $I_{C(sat)} = \frac{V_{CC} - V_{CE(sat)}}{R_C + R_E} = \frac{12\text{ V} - 0.2\text{ V}}{0.5\text{ k}\Omega + 1.5\text{ k}\Omega}$

$≒ \frac{11.8\text{ V}}{2\text{ k}\Omega} ≒ 5.9$ mA

(3) $I_{CQ} = \beta\,I_B = 100 \times 28.25\,\mu\text{A} = 2825\,\mu$A

$= 2.83$ mA < 5.9 mA 工作於線性區

(4) $V_{CE} = V_{CC} - I_C R_C - I_E R_E ≒ V_{CC} - I_C(R_C + R_E)$

$= 12\text{ V} - 2.83\text{ mA} \times (0.5\text{ k}\Omega + 1.5\text{ k}\Omega) = 12\text{ V} - 5.66$ V

$≒ 6.34$ V

37. $I_{C(sat)} = \frac{V_{CC} - V_{CE(sat)}}{R_C + R_E} = \frac{12\text{ V} - 0.2\text{ V}}{3\text{ k}\Omega + 1\text{ k}\Omega} = \frac{11.8\text{ V}}{4\text{ k}\Omega} ≒ 2.95$ mA

(A) $I_B = \frac{V_{CC} - V_{BE}}{R_B + (1+\beta)(R_C + R_E)}$

$= \frac{12\text{ V} - 0.7\text{ V}}{100\text{ k}\Omega + (1+100)(3\text{ k}\Omega + 1\text{ k}\Omega)} = \frac{11.3\text{ V}}{100\text{ k} + 404\text{ k}}$

$= \frac{11.3\text{ V}}{504\text{ k}\Omega} = 22.42\,\mu$A

(B) $I_C = \beta\,I_B = 100 \times 22.42\,\mu\text{A} = 2.242$ mA

(C) $V_C = V_{CC} - (1+\beta)I_B R_C$

$= 12\text{ V} - (1+100) \times 22.42\,\mu\text{A} \times 3\text{ k}\Omega$

$= 12\text{ V} - 6.79\text{ V} = 5.21$ V

(D) $V_E = (1+\beta)I_B R_E = (1+100) \times 22.42\,\mu\text{A} \times 1\text{ k}\Omega$

$= 2.264\text{ V} ≒ 2.3$ V

38. $V_o = V_E - V_{BE} = 5\text{ V} - 0.7\text{ V} \approx 4.3$ V

39. $\because I_B = \frac{V_{CC} - V_{BE}}{R_B} = \frac{11\text{ V} - 0.7\text{ V}}{396\text{ k}\Omega} = \frac{10.3\text{ V}}{396\text{ k}\Omega}$

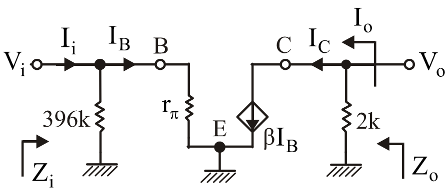
$≒ 26\,\mu$A，$\therefore r_\pi = \frac{V_T}{I_B} = \frac{26\text{ mV}}{26\,\mu\text{A}} ≒ 1\text{ k}\Omega$

(A) $A_i = \frac{I_o}{I_i} = \frac{\beta\,I_B}{\frac{396\text{ k} + 1\text{ k}}{396\text{ k}} I_B} ≒ \beta ≒ 100$

(B) $A_V = \frac{V_o}{V_i} = \frac{-\beta\,I_B R_C}{I_B r_\pi} = \frac{-100 \times I_B \times 2\text{ k}\Omega}{I_B \times 1\text{ k}\Omega} ≒ -200$

(C) $Z_o = 2\text{ k}\Omega$

(D) $Z_i = 396\text{ k} // 1\text{ k}\Omega ≒ 1\text{ k}\Omega$



40. $\because \frac{V_o}{V_i}=\frac{I_o}{I_i}\times\frac{Z_o}{Z_i}$，$\therefore Z_i=\frac{I_o}{I_i}\times\frac{V_i}{V_o}\times Z_o=A_i\times\frac{1}{A_v}\times Z_o$

$=50\times\frac{1}{500}\times 5\text{ k}\Omega=\frac{1}{2}\text{ k}\Omega$

41. (A) $\beta_1\ \beta_2\ R_E \doteqdot \beta^2\ R_E$
(C) 低，1
(D) 高，β^2

42. 當 $V_{GS}=0\text{ V}$ 時，$I_D=I_{DSS}(1-\frac{V_{GS}}{V_P})^2$

$=18\text{ mA}\times(1-\frac{0\text{ V}}{-3\text{ V}})^2=18\text{ mA}\times(1-0)^2=18\text{ mA}$

$\because V_{GS}=-4\text{ V}$ 已超出 $V_P=-3\text{ V}$ 被截止

$\therefore I_D=0\text{ mA}$

43. $I_D=k(V_{GS}-V_T)^2=0.3\text{ mA}/\text{V}^2\times(5\text{ V}-2\text{ V})^2$

$=0.3\times 3^2=2.7\text{ mA}$

44. (1) $V_{GS}=V_G-V_S=I_GR_G-I_SR_S\ (\because I_S=I_D)$

$=0\times R_G-I_DR_S=0-1.5\text{ mA}\times 1\text{ k}\Omega=-1.5\text{ V}$

$g_m=\frac{2\ I_{DSS}}{|V_P|}\times(1-\frac{V_{GS}}{V_P})=\frac{2\times 12\text{ mA}}{|-3\text{ V}|}\times(1-\frac{-1.5\text{ V}}{-3\text{ V}})$

$=\frac{2\times 12}{3}\times(1-\frac{1}{2})=4\text{ mS}$

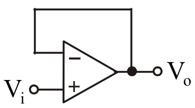
(2) $Z_i=R_G=1\text{ M}\Omega$，$Z_o=R_D=4\text{ k}\Omega$

(3) $A_V=\frac{-g_mR_D}{1+g_mR_S}=\frac{-4\text{ mS}\times 4\text{ k}\Omega}{1+4\text{ mS}\times 1\text{ k}\Omega}=\frac{-16}{1+4}=\frac{-16}{5}$

$=-3.2$

(4) $A_i=|A_V|\times\frac{Z_i}{R_D}=3.2\times\frac{1\text{ M}\Omega}{4\text{ k}\Omega}\doteqdot 800$

45. (C)



46. 此為非反相放大器 $V_o=(1+\frac{R_1}{R_2})\ V_i$

$\therefore V_o=(1+\frac{6\text{ k}\Omega}{6\text{ k}\Omega})\times 6\sin 377t=12\sin 377t$

47. ① 先求上下臨界電壓

$V_+=\frac{2\text{ k}}{2\text{ k}+4\text{ k}}(+12\text{ V})=4\text{ V}$

$V_-=\frac{2\text{ k}}{2\text{ k}+4\text{ k}}(-12\text{ V})=-4\text{ V}$

② 可求電容兩端峰對峰電壓

$\therefore V_{C(P-P)}=4\text{ V}-(-4\text{ V})=8\text{ V}$

48. $\because \beta\ A=1\angle 0^\circ=1\angle 360^\circ$ 且 $A=10\angle 150^\circ$

$\therefore \beta=\frac{1\angle 0^\circ}{10\angle 150^\circ}=0.1\angle -150^\circ$ 或 $0.1\angle 210^\circ$

49. 此為反相舒密特電路，且上下限臨界電壓為

$V_u=+12\text{ V}\times\frac{R_1}{R_1+R_2}=+6\text{ V}$

$V_L=-12\text{ V}\times\frac{R_1}{R_1+R_2}=-6\text{ V}$

為正弦波之波峰與波谷，可以使 OPA 符合轉態
故輸出為相同頻率的方波

50. $T=0.693(R_{B1}C_1+R_{B2}C_2)=0.693(R_2C_1+R_3C_2)$