九十八學年四技二專第三次聯合模擬考試
電機電子群電機類　專業科目（二）　詳解

98-3-03-5

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
B	A	C	C	B	D	D	A	C	A	C	C	B	B	D	A	C	D	D	B	A	C	D	B	B
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
D	A	D	C	B	D	C	A	D	A	D	B	C	D	A	B	D	B	A	C	A	A	B	B	C

第一部份：電工機械

1. $e = N\frac{\Delta\phi}{\Delta t} = N\frac{\Delta BA}{\Delta t} = 100 \times \frac{0.1 \times (0.1 \times 0.1)}{\frac{1}{\frac{600}{60}} \times \frac{1}{4}} = 4\ \text{V}$

2. $\frac{100}{200} = \frac{k \cdot \phi \cdot 50}{k \cdot 0.8\phi \cdot I'_a} \Rightarrow I'_a = 125\ \text{A}$

4. $a_{疊} = mp = 4$ ， $a_{波} = 2\ m = 2$ ， $\frac{a_{疊}}{a_{波}} = 2$

6. $100 \times (R_a + 5R_a) = 12 \Rightarrow R_a = 0.02\ \Omega$
   $R_S = 5R_a = 0.1\ \Omega$

8. 鐵損爲固定損失

9. $R'_2 = 0.01 + \frac{1}{100} = 0.02\ \Omega$

10. $R' = 0.075 \times \frac{200}{50} = 0.3\ \text{Pu}$ ， $X' = 0.1 \times \frac{200}{50} = 0.4\ \text{Pu}$
    $Z' = \sqrt{0.3^2 + 0.4^2} = 0.5\ \text{Pu}$

11. $\eta = \frac{8 \times 10\ \text{k} \times 1}{8 \times 10\ \text{k} \times 1 + 8 \times 0.24 + 24 \times 0.1} = \frac{80}{84.32} = 0.949$

12. $S_{自} = 100\ \text{k}(1 + \frac{1200}{400}) = 400\ \text{kVA}$

14. $n_s = \frac{120 \times 60}{6} = 1200\ \text{rpm}$
    $s = \frac{n_s - n_r}{n_s} = \frac{1200 - 1000}{1200} = \frac{1}{6}$，$f_r = sf_s = \frac{1}{6} \times 60 = 10\ \text{Hz}$

第二部份：電子學實習

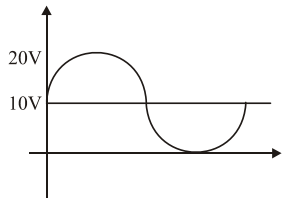
19. N 型半導體多數載子爲電子，少數載子爲電洞

20. $\because 12 \times \frac{100\ \text{k}}{100\ \text{k} + 5\ \text{k}} > 6\ \text{V}$，$D_2$ ON，D_1 OFF，$V_o = 6\ \text{V}$

21. $I_S = 0 + 6\ \text{m} = \frac{12 - 6}{R_S} \Rightarrow R_S = 1\ \text{k}\Omega$

22. $V_m = 110\sqrt{2}\ \text{V}$ ， $V_{r(p-p)} = \frac{V_m}{R_L C \times f_r}$
    $= \frac{110\sqrt{2}}{1\ \text{k}\Omega \times 1000\ \mu\text{F} \times 60\ \text{H}_Z} = \frac{11\sqrt{2}}{6} \Rightarrow V_{r(m)} = \frac{V_{r(p-p)}}{2} = 1.3$

23.



24. 電晶體在主動區時，BE 接面順偏，CB 接面逆偏

25. 採近似解法， $V_B = -10 \cdot \frac{10\ \text{k}}{10\ \text{k} + 40\ \text{k}} = -2\ \text{V}$
    $I_E = \frac{2 - 0.7}{1\ \text{k}} = 1.3\ \text{mA} \cong I_C$

26. $I_E = \frac{10 - 0.7}{1\ \text{k} + \frac{100\ \text{k}}{1 + 100}} \cong \frac{9.3}{2\ \text{k}} = 4.65\ \text{mA} \cong I_C$
    $V_{EC} = 20 - 4.65\ \text{m} \cdot (1\ \text{k} + 2\ \text{k}) = 6.05\ \text{V}$
    $V_{CE} = -V_{EC} = -6.05\ \text{V}$

27. 此電晶體工作於飽和區，因此 $A_V = 0$

28. 耦合電容、旁路電容影響低頻響應，極際電容、雜散電容影響高頻響應

29. 電壓增益近似於 1

31. $\because I_G = 0$ ，$\therefore V_{GS} = V_{DS}$ ， $I_D = K(V_{GS} - V_T)^2$
    $\frac{8 - V_{DS}}{1\ \text{k} + 1\ \text{k}} = 0.5\ \text{m}(V_{DS} - 2)^2 \Rightarrow V_{DS}^2 - 3V_{DS} - 4 = 0$
    $\Rightarrow V_{DS} = 4$ 、 -1(不合) ， $I_D = \frac{8 - 4}{2\ \text{k}} = 2\ \text{mA}$

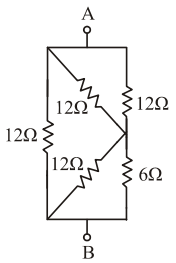
32. $g_m = \frac{2I_{DSS}}{|V_P|}(1 - \frac{V_{GS}}{V_P}) = \frac{2 \cdot 12\ \text{m}}{4}(1 - \frac{-2}{-4}) = 3\ \text{mS}$

33. $10\ \text{k} \cdot i = R \cdot 8i \Rightarrow R = \frac{5}{4}\ \text{k}\Omega$

34. $V_o = 6 - 2\ \text{m} \times 2\ \text{k} + 3 = 5\ \text{V}$

第三部份：基本電學實習

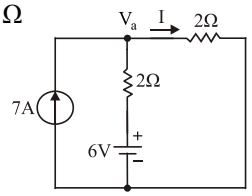
35. $R_\Delta = 3\,R_Y = 3 \times 4\ \Omega = 12\ \Omega$
    $R_{AB} = [(12\,//\,12) + (12\,//\,6)]\,//\,12$
    $= 10\,//\,12 = \frac{60}{11}\ \Omega$



36. $I = \frac{100}{100} + \frac{100}{50} + \frac{100}{25} = 7\ \text{A} > 5\ \text{A}$
    ∴保險絲燒斷， $I = 0\ \text{A}$

37. $20 = 2\,R + 4 \times (R + 2) \Rightarrow R = 2\,\Omega$

38. 因 1 Ω 與 6 V 並聯，可忽略 1 Ω



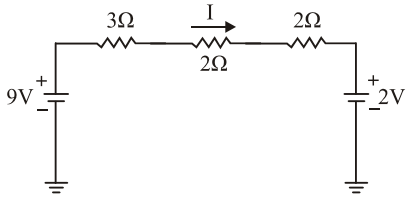
$$V_a = \frac{7+3}{\frac{1}{2}+\frac{1}{2}} = 10\text{ V}$$

$$I = \frac{10}{2} = 5\text{ A}$$

39. R↓，I↑，P↑，H↑

40. 左右兩邊取戴維寧等效電路

$$I = \frac{9-2}{3+2+2} = 1\text{ A}$$



46. $I_1 = \dfrac{100\angle 0^\circ}{6+j8} = 6 - j8$ ， $I_2 = \dfrac{100\angle 0^\circ}{8-j6} = 8 + j6$

$$I = I_1 + I_2 = 14 - j2 = 10\sqrt{2}\angle\theta$$

47. $R_{串} = \dfrac{30^2+30^2}{30} = 60\,\Omega$ ， $X_{串} = \dfrac{30^2+30^2}{30} = 60\,\Omega$

$$Z'_{串} = 60 + j(60 \times 2) = 60 + j120\,\Omega$$

48. $T_S = \dfrac{1}{f} = 1\text{ mS}$ ， $T_1 = 1\text{ mS} \times \dfrac{90}{360} = 0.25\text{ mS}$

50. $\bar{I} = \dfrac{\overline{E}}{8+j6} = \dfrac{100\angle 0^\circ}{10\angle 37^\circ} = 10\angle -37^\circ\text{ A}$

$$P_R = I^2R = 10^2 \times 8 = 800\text{ W}$$