

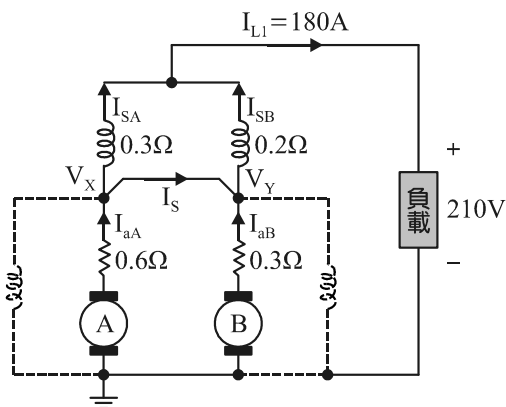
104 學年度四技二專第二次聯合模擬考試 電機與電子群電機類 專業科目(二) 詳解

104-2-03-5

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

第一部分：電工機械

1. 以 KVA 表示
3. $E_{av} = \frac{PZ}{2\pi a} \phi \omega = \frac{6 \cdot 1000 \cdot 2}{2\pi \cdot (2 \cdot 6)} \cdot 5 \times 10^5 \times 10^{-8} \cdot 120 = \frac{300}{\pi} \text{ V}$
4. $E_m \cdot I_a = \omega \cdot T \Rightarrow E_m \cdot 8 \cdot 2 = 10 \cdot 2\pi \cdot 1 \cdot 9.8$
 $E_m = 12.25\pi \text{ V}$
6. $F_C = \frac{Z}{2} \cdot \frac{I_a}{a} \cdot \frac{2P\alpha}{360} = \frac{288}{2} \cdot \frac{120}{4 \cdot 1} \cdot \frac{(360 - 2 \cdot 4 \cdot 15)}{360} \cdot \frac{2}{4}$
 $= 1440 \text{ AT}$
7. $e_r = L \frac{\Delta I_C}{\Delta t} = 10 \text{ m} \cdot \frac{16}{14 \text{ ms}} = 11.42 \text{ V}$
9. $E_g = 200 + \frac{80000}{200} \cdot (0.04 + 0.06 // 0.12) + 2 \cdot 2 = 236 \text{ V}$
10. A 機的負載電流 $I_{SA} = 180 \cdot \frac{0.2}{0.2 + 0.3} = 72 \text{ A}$
B 機的負載電流 $I_{SB} = 180 \cdot \frac{0.3}{0.2 + 0.3} = 108 \text{ A}$

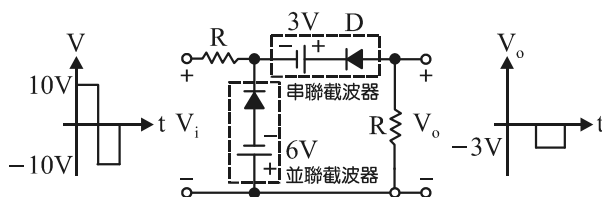


12. 磁通未飽和時 $T \propto I_a^2$ (拋物線)
 $100 : T = 20^2 : 10^2 \Rightarrow T = 25 \text{ 牛頓-米}$
14. 串激式電動機起動時將分流電阻置於最大值，此時有最大轉矩以及低轉速
15. $R_{e1} = 12 + (48 + 24) \cdot 0.5^2 = 30 \Omega$
 $X_{e1} = 18 + (56 + 32) \cdot 0.5^2 = j40 \Omega$
 $Z_{e1} = \sqrt{30^2 + 40^2} = 50 \Omega, I_1 = \frac{100}{50} = 2 \text{ A}$
16. $V.R\% = R_{pu} \cdot \cos\theta \pm X_{pu} \cdot \sin\theta = 0.6 \cdot 0.707 - 0.8 \cdot 0.707 = -14.14\%$

17. 兩者的激磁電導、導納以及電納皆相同，僅鐵損不同
18. (1) 變壓器輸出功率
 $P_o : 8 \text{ K} \cdot 0.6 \cdot 1.8 + 8 \text{ K} \cdot 0.6 \cdot 0.5 \cdot 8 = 57.6 \text{ KVA}$
(2) 總鐵損： $P_{iron} = 300 \cdot 16 = 4800 \text{ W}$ (實際工作的時數)
(3) 總銅損 $P_{cu} = 500 \cdot 1.8 + 500 \cdot 0.5^2 \cdot 8 = 5000 \text{ W}$
(4) $\eta_{全日} = \frac{57.6 \text{ K}}{57.6 \text{ K} + 4.8 \text{ K} + 5 \text{ K}} = 85.46\%$
19. (1) $V_{L2} = \sqrt{3} \cdot V_{P2} \Rightarrow V_{P2} = \frac{180}{\sqrt{3}} \text{ V}$
 $a = \frac{V_{P1} = V_{L1}}{V_{P2}} \Rightarrow \frac{3300}{300} = \frac{V_{L1}}{180} \Rightarrow V_{L1} = \frac{1980}{\sqrt{3}} \text{ V}$
(2) $I_{L1} = \sqrt{3} \cdot I_{P1} \Rightarrow I_{P1} = \frac{2}{\sqrt{3}} \text{ A}$
 $a = \frac{I_{P2} = I_{L2}}{I_{P1}} \Rightarrow \frac{3300}{300} = \frac{I_{L2}}{2} \Rightarrow I_{L2} = \frac{22}{\sqrt{3}} \text{ A}$
20. 通過共用繞組的電流為 40 A

第二部分：電子學實習

21. $\frac{\left(\sqrt{\frac{(V_m \cdot 1)^2 \cdot 1}{3}}\right)^2}{9} = 3 \Rightarrow V_m^2 = 81 \Rightarrow V_m = 9 \text{ V}$
22. (1) $122 = \frac{9}{5} \cdot t + 32 \Rightarrow t = 50^\circ\text{C}$
(2) $50 = \frac{9}{5} \cdot t + 32 \Rightarrow t = 10^\circ\text{C}$
(3) $I_o = 32 \mu\text{A} \cdot 2^{\frac{10-50}{8}} = 32 \mu\text{A} \cdot 2^{-5} = 1 \mu\text{A}$
23. $V_{r(P-P)} \cong \frac{V_m}{2 \cdot f_s \cdot R_L \cdot C} = \frac{44}{2 \cdot \frac{100}{2\pi} \cdot 22 \text{ K} \cdot 40 \mu} = \frac{1}{2} \pi \text{ V}$
25. $V_{O(dc)} = \frac{-3}{2} = -1.5 \text{ V}$



26. (1) $I_{L(\min)} = \frac{50-12}{500} - \frac{360 \text{ mW}}{12} = 46 \text{ mA}$

$R_{L(\max)} = \frac{12}{46 \text{ mA}} \approx 260 \Omega$

(2) $50 \cdot \frac{R_L}{500+R_L} > 12 \Rightarrow R_L > 158 \Omega$

27. 仍符合克西荷夫電流定律(KCL), $I_E = I_C + I_B$

28. 利用戴維寧等效電路與密爾門定理化簡電路如右:

$I_B = \frac{3-0.7}{200 \text{ K}} = 11.5 \mu\text{A}$

$I_C = \beta \cdot I_B = 11.5 \mu\text{A} \cdot 40 = 0.46 \text{ mA}$

$I_{C(\text{sat})} = \frac{14-0.2}{4 \text{ K}} = 3.45 \text{ mA}$

$\therefore I_B \cdot \beta < I_{C(\text{sat})}$ 操作於工作區, $V_B = -0.7 \text{ V}$

$I_2 = \frac{(6+12 \cdot 16)}{12 \text{ K}} \cong 1.5 \text{ mA}$

29. NPN 電晶體工作於飽和區, $V_B > V_C > V_E$

30. $A_v = \frac{V_o}{V_i} = -\beta \times \frac{R_C // R_L}{r_\pi} = -150 \times \frac{(5 // 10)}{1.25}$

$= -150 \times \frac{(\frac{10}{3})}{1.25} = -\frac{500}{1.25} = -400$

32. $\frac{4 \text{ M}}{4 \text{ M} + 2 \text{ M}} (1 + h_{fe1})(1 + h_{fe2}) \cdot \frac{8 \text{ K}}{8 \text{ K} + 4 \text{ K}} = 500$

$(1 + h_{fe1})(1 + h_{fe2}) = 1125$

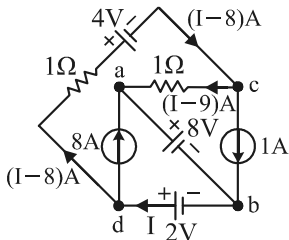
$\therefore h_{fe1} = 44, h_{fe2} = 24$ 較符合需求

33. BJT 增益頻寬大; FET 增益頻寬積小

第三部分：基本電學實習

38. 利用戴維寧定理分別對 a、b 以及 c、d 端點，化簡電路如下電路圖所示，並利用迴路電流法列出下列方程式：

$2 = (I - 0.8) \cdot 1 + 4 + (I - 9) \cdot 1 + 8 \Rightarrow I = 3.5 \text{ A}$



39. $(R + 0.5R) // R = 6 \text{ K}\Omega \Rightarrow \frac{3}{5} R = 6 \text{ K}\Omega \Rightarrow R = 10 \text{ K}\Omega$

40. $\frac{48}{2R_2} = 4 \Rightarrow R_2 = 6 \Omega$

41. $I_C = 5 \text{ KA}$ 表示無熔絲開關可啓斷的最大電流(因此 $5500 \text{ A} > 5000 \text{ A}$ 無法啓斷)

42. $\frac{3.6 \times 10^6 \times 1}{1000 \times 6} = 600 \text{ 瓦特}$

43. 1.25 表示導線的截面積; 5 表示螺絲的孔徑; Y 表示端子的形狀

44. 本尺刻度 1 mm, 游尺分 50 格

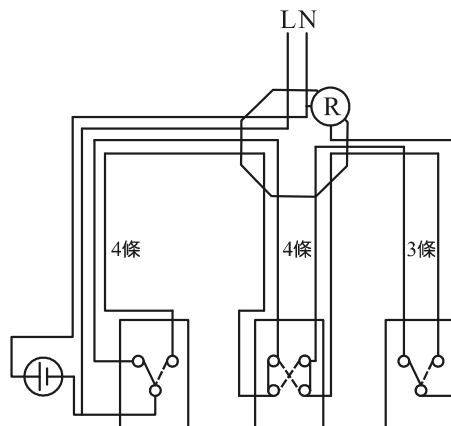
故每格精度 $\frac{1}{50} \text{ mm} = 0.02 \text{ mm}$

又游尺 0 刻度位於本尺 19~20 格間 $\Rightarrow 19 \text{ mm}$

游尺 18 格對準本尺刻度 $\Rightarrow 18 \cdot 0.02 = 0.36$

$\therefore 19 + 0.36 = 19.36 \text{ mm}$

46.



47. DUAL 可同時顯示 CH_1 及 CH_2 的波形於示波器上，由於 CH_1 及 CH_2 負端(黑棒)內部短接，因此黑棒與黑棒需相接

49. $\tau = \frac{L}{R} = 1 \mu\text{s} \Rightarrow$ 穩態需 $5 \mu\text{s}$

50. $I_D(0^+) = \frac{20}{10} = 2 \text{ A}$