

一、選擇題 (第 1~32 題，每題 3 分；第 33 題 4 分)

01.(D)、02.(A)、03.(D)、04.(C)、05.(D)、06.(B)、07.(D)、08.(B)、09.(C)、10.(A)、
11.(B)、12.(C)、13.(C)、14.(A)、15.(D)、16.(A)、17.(D)、18.(C)、19.(D)、20.(D)、
21.(C)、22.(A)、23.(C)、24.(D)、25.(B)、26.(A)、27.(C)、28.(B)、29.(B)、30.(B)、
31.(D)、32.(A)、33.(A)

解析：

一、選擇題：

2.(1) V_{RL} 本身分壓必須大於 V_Z

$$12V \times \frac{R_L}{R + R_L} \geq V_Z \Rightarrow 12 \times \frac{R_L}{0.5k\Omega + R_L} \geq 6.7V$$

(2)

$$\Rightarrow R_L \geq 0.63k\Omega$$

3.(1)

$$I_{Zmax} \leq \frac{400mW}{V_Z} = 40mA$$

(2)

$$V_{RL} \geq V_Z \Rightarrow 50V \times \frac{R_{Lmin}}{500\Omega + R_{Lmin}} \geq 10V$$

$$\Rightarrow R_{Lmin} \geq 125\Omega$$

(3)

$$I_{500\Omega} = \frac{50V - V_Z}{500\Omega} = \frac{50V - 10V}{500\Omega} = 80mA$$

$$\Rightarrow I_{500\Omega} = I_Z + I_{RL}$$

$$\Rightarrow I_{RLmin} \geq 80mA - 40mA = 40mA$$

$$\Rightarrow R_{Lmax} \leq \frac{10V}{40mA} = 250\Omega$$

(4) $\therefore R_L$ 介於 $250\Omega \sim 125\Omega$ 之內

5.

$$V_{rP-P} = V_m \times \frac{t}{RC} \Rightarrow 2 = 200 \times \frac{60}{10k\Omega \times C} \Rightarrow C = \frac{100}{6} \mu F = 166.6 \mu F$$

6.(1)

$$V_{av} = \frac{11+9}{2} = 10V$$

(2)

$$V_{r(ms)} = \frac{V_{P-P}}{2\sqrt{3}} = \frac{2V}{2 \times 1.732} = 0.577V$$

$$(3) r\% = \frac{V_{r(\text{rms})}}{V_{av}} \times 100\% = \frac{0.577}{10} \times 100\% = 5.77\%$$

$$8.(1) I_{C(\text{sat})} = \frac{V_{CC}}{R_C + R_B} = 7.2\text{mA} = \frac{18\text{V}}{2\text{k} + R_B}$$

$$\Rightarrow R_B = 0.5\text{k}\Omega$$

$$(2) I'_{C(\text{sat})} = 14.4\text{mA} = \frac{18\text{V}}{0.5\text{k}\Omega + R'_C}$$

$$\Rightarrow R'_C = 0.75\text{k}\Omega$$

$$9.(1) V_{CC} = 6\text{V} > 0.2\text{V}, \text{ 在工作區}$$

$$(2) I_C = \frac{V_{CC} - V_{CE}}{R_C} = \frac{6\text{V}}{2\text{k}\Omega} = 3\text{mA}$$

$$(3) I_B = \frac{V_{CC} - V_{BE}}{R_B} = \frac{11.3\text{V}}{390\text{k}\Omega} = 29\mu\text{A}$$

$$(4) \beta = \frac{I_C}{I_B} = 103.4$$

11.飽和狀態之 BJT 已不具任何放大能力(作用), $A_V = 0$ 倍

$$12.(1) r_s = \frac{V_T}{I_B} = \frac{25\text{mV}}{\frac{1\text{mA}}{100}} = 2.5 \text{ k}\Omega$$

$$(2) Z_b = r_s = 2.5 \text{ k}\Omega \quad (3) Z_o = R_C = 10 \text{ k}\Omega$$

$$(4) A_V = \frac{V_o}{V_i} = -\beta \times \frac{R_C}{r_s} = -100 \times \frac{10\text{k}\Omega}{2.5\text{k}\Omega} = -400 \text{ 倍}$$

$$16.(1) \text{dB}_T = \text{dB}_1 + \text{dB}_2 = 10\text{dB} + 30\text{dB} = 40\text{dB}$$

$$(2) 40\text{dB} \Rightarrow A_{VT} = 100 \text{ 倍}$$

$$(3) V_o = V_i \times A_{VT} = 1\sin(t)\text{V}$$

(4)有效值

18.90 奈米, 應指 “通道長度 L ”, 只好選(A)

$$20. 20 \log \frac{1}{\sqrt{2}} = -3\text{dB}$$

$$22. f_L = \frac{1}{2\pi RC} = 0.16 \times \frac{1}{3k\Omega \times 0.1\mu F} = 0.533kHz$$

$$24.(1) T = T_1 + T_2 = 0.7 \times [(10k\Omega + 30k\Omega) + 30k\Omega] \times 0.01\mu = 0.49 \text{ m sec}$$

$$(2) f = \frac{1}{T} = \frac{1}{0.49 \text{ m sec}} = 2.04kHz$$

$$25. T = R \times C \times \ln 3 = 1.1 \times 1M\Omega \times 1\mu F = 1.1 \text{ 秒}$$

$$26. V_{av} = \frac{2 \times 2 + 2 + 1 \times 3 + (-1) \times 1}{4} = 1 \text{ V}$$

27.(1) 共汲式 $A_v < 1$ ，且同相放大，只剩下(A)有資格

$$(2) A_v = \frac{g_m R_s}{1 + g_m R_s} = \frac{2.3mS \times 2.2k\Omega}{1 + 2.3mS \times 2.2k\Omega} = \frac{5.06}{6.06} = 0.835$$

$$29.(1) T = T_1 + T_2 = 0.7(33k\Omega \times 0.001\mu F + 10k\Omega \times 0.001\mu F) = 0.30301ms$$

$$(2) f = \frac{1}{T} = 33.2kHz$$