Tutorial – III <Hints>

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1) The reflected load resistance for one transistor,

$$R_L' = \left(\frac{a}{2}\right)^2 R_L \quad ; \text{where, } a = \frac{N_1}{N_2}$$

$N_1 = 100$; $N_2 = 50$; $R_L = 10\Omega$

$$a = \frac{N_1}{N_2} = \frac{100}{50} = 2$$

$$\therefore R_L' = \left(\frac{2}{2}\right)^2 \times 10 = 10\Omega$$

For maximum output power, the collector voltage swing corresponds to $V_{cm} = V_{cc}$

The maximum output power for the two transistor is then,

$$(P_{ac})_{total} = \frac{V_{cc}^2}{2R_L'} = \frac{(20)^2}{2\times 10} = \underline{\underline{20 \text{ watts}}}$$

max. power delivered to load.

The maximum dc power supplied to the two transistors is,

$$(P_{dc})_{total} = \frac{2V_{cc}^2}{\pi R_L'} = \frac{2\times(20)^2}{\pi \times 10}$$

$$\therefore (P_{dc})_{total} = 25.46\,W$$

Now,

$$\text{Efficiency}(\eta) = \frac{(P_{ac})_{total}}{(P_{dc})_{total}} \times 100\%$$

$$= \frac{20}{25.46} \times 100\%$$

$$= \underline{\underline{78.55\%}}$$

Scanned with CamScanner

2) (Same as done in class)

o/p impedance of transistor $= \dfrac{\Delta V_{CE}}{\Delta I_C} = \dfrac{12}{100 \times 10^{-3}}$

$= \underline{\qquad\qquad}$

$R_L' = a^2 R_L \; ; \; a = \dfrac{N_1}{N_2}$

$R_L \rightarrow 5\Omega$

{ for max. power trf. $= R_L'$

$\Rightarrow a = \underline{\qquad\qquad}$

$V_2 = V_L = \dfrac{V_1}{a}$; $V_1 \rightarrow 12V$

$I_L = \dfrac{V_L}{R_L} = \underline{\qquad\qquad}$

power trf. to loudspeaker $= I_L^2 R_L$

$= \underline{\qquad\qquad}$

3) Done in class

4) Here,

$R_L' = a^2 R_L \; ; \; a = \dfrac{N_1}{N_2} = \dfrac{4}{1} = 4$

$\therefore R_L' = (4)^2 90 = \underline{\qquad\qquad}$

$\dfrac{V_2}{V_1} = \dfrac{N_2}{N_1} = \dfrac{I_1}{I_2}$

$\Rightarrow I_2 = I_L = I_1 \times \dfrac{N_1}{N_2} = I_1 \times a = \underline{\qquad\qquad}$; $I_1 \rightarrow 120mA$

Max o/p power $= I_L^2 R_L = \underline{\qquad\qquad}$

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5) Here,

open loop gain (A) = 150

feedback ratio (β) = 0.04

open loop gain changes by 15%.

i.e., $\frac{dA}{A} = 0.15$

$\frac{dA_f}{A_f} = ?$

we know,

$$\frac{dA_f}{A_f} = \frac{dA}{A} \times \frac{1}{1+\beta A} = \_\_\_\_\_\_$$

6) Same as Question 5)

7) Here,

Open loop gain (A) = 100

Gain with feedback (A_f) = 50

i) $\beta = ?$

$$A_f = \frac{A}{1+A\beta}$$

$$\Rightarrow \beta = \_\_\_\_\_\_$$

ii) $\beta = \_\_\_$ (maintained)

$A_f = 75$

$A = ?$

$$A_f = \frac{A}{1+A\beta}$$

$$\Rightarrow A = \_\_\_\_\_\_$$

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8) Here,

$\beta = 0.2\% = 0.002$

$A = 60dB$

$20\log_{10}(A) = 60dB$

$\log_{10}(A) = \frac{60}{20} = 3$

$\therefore A = 10^3 = 1000$

$\frac{dA}{A} = 15\% = 0.15$

we know,

$\frac{dA_f}{A_f} = \frac{dA}{A} \times \frac{1}{1+\beta A}$

$\frac{dA_f}{A_f} = \_\_\_\_\_\_$

9) $f = 50KHz = 50\times10^3 Hz$

$f = \frac{1}{2\pi RC}$

Let $c = 0.01\mu f$

then,

$R = \_\_\_\_\_\_$

Also,

$\frac{R_f}{R_g} = 2$

Let $R_g = 10k\Omega$

then,

$R_f = \_\_\_\_\_\_$

Draw fig.

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10) Here,

$L_1 = 3mH$, $L_2 = 25\mu H$

freq. of osc. 950 KHz to 1050 KHz

$$f = \frac{1}{2\pi\sqrt{L_{eq}C}} \quad ; \; L_{eq} = L_1 + L_2$$

11) Here,

$$\frac{R_3}{R_4} = \frac{22k\Omega}{11k\Omega} = 2$$

$$R_3 = 2R_4$$

Since, $R_3 = 2R_4$ (Nt: $R_f = 2R_g$), the circuit will oscillate

$$f = \frac{1}{2\pi RC} = \frac{1}{2\pi \times 5.1\times10^3 \times 1\times10^{-9}} = \_\_\_\_$$

12) Same as Question 9)

13) Here,

$$f = \frac{1}{2\pi\sqrt{L\,C_{eq}}} \quad ; \; C_{eq} = \frac{C_1C_2}{C_1+C_2}$$

feedback fraction $(\beta) = \frac{C_2}{C_1}$