Tutorial-6

1) $R_i = h_{ie}$

$\Rightarrow R_i = 1500\Omega$

$A_I = -h_{fe} = -50$

$R_o = \frac{1}{h_{oe}} = \frac{1}{20\times10^{-6}} = 5\times10^4\,\Omega$

$r_L = R_c \| R_L = 3.3k\Omega$

i/p resistance $\Rightarrow R_{ie} = R_i \| (R_1 \| R_2) = 1.22k\Omega$

$A_v = A_I \frac{r_L}{R_I} = \frac{-50\times3.3\times10^3}{1500} = -110$

2) $R_c = 12k\Omega$

$R_L = 4.7k\Omega$

$r_L = 4.7 \| 12 = 3.37k\Omega$

$R_1 = 33k\Omega$ $I_c = 1mA$

$R_2 = 4.7k\Omega$

$h_{ie} = 1k\Omega$ to $5k\Omega$

↳ G. Avg $= \sqrt{min \times max}$

$= 2.23k\Omega$

$h_{fe} = 70$ to $350\,\Omega$

↳ G. Avg $= \sqrt{min \times max} = \sqrt{70\times350}$

$= 156.52$

$A_v = \frac{h_{fe} r_L}{h_{ie}} = 236.53$

Input impedance $= z_{in(base)} \| R_1 \| R_2$

$= h_{ie} \| R_1 \| R_2$

$= 2.23 \| 33 \| 4.7$

$= 1.44k\Omega$

3) $h_{fe} = 120$ $h_{ie} = 1.175k\Omega$ $h_{oe} = 20\mu A\,V^{-1}$

$h_{fe} = \frac{I_c}{I_b}$, $h_{ie} = \frac{V_{be}}{I_b}$

$h_{re} = \frac{V_{be}}{V_{ce}}$, $h_{oe} = \frac{I_c}{V_{ce}}$

Input $R_I = h_{ie} = 1.175k\Omega$

$A_I = -h_{fe} = -120$ $Z_i = h_{ie} \| R_B = 1.17k\Omega$

$$R_o = \frac{1}{h_{oe}} = 50k\Omega$$

$$Z_o = R_o \| r_L$$

$$2.56\,k\Omega$$

$$A_{vs} = 275.7$$

4)- $h_{fe} = 50$, what is h_{fb} and h_{fc}

$$h_{fb} = \frac{50}{51} = -0.98 = \frac{-h_{fe}}{1+h_{fe}}$$

$$h_{fc} = -(51)$$

5)- $h_{ie} = 1100\Omega$ $\quad h_{ie} = 1100\Omega$

$h_{re} = 2.5\times10^{-4}$ $\quad h_{re} = 1-(2.5\times10^{-4})$

$h_{oe} = 24\mu AV^{-1}$ $\quad h_{fc} = -51$

$R_L = 10k\Omega$ $\quad \Rightarrow h_{oe} = 24\mu AV^{-1}$

$R_s = 1k\Omega$

$$A_I = \frac{51}{1+(24\times10^{-6})(10^4)} = \frac{51}{1.24} = 41.13$$

$$A_v = \frac{A_i R_L}{R_I} = \frac{41.13\times10\times10^3}{411.371\times10^3} = 0.99975$$

$$R_I = 1100 + (0.99975)(10^4)(41.13)$$

$$= 1100 + 410271.75$$

$$= 411.371k\Omega$$