

S.No.	Question	Answer all Questions	Mar ks	C O	BL
1	<p>Determine the Q point and draw the load line for the circuit in Fig. (a). The transistor parameters are $V_{TN} = 0.8$ V, and $K_n'(W/L) = 1$ mA/V².</p> $V_{OT} = \frac{V_{DD}}{R_1 + R_2}$ $V_{OLS} = V_{OT} - V_S$ $V_S > I_D R_{DS}$ $I_D = \frac{1}{2} K (V_{DS} - V_{Th})^2$ $V_{DS} = V_{DD} - I_D (R_D + \frac{R_2}{R_1 + R_2})$ $Q(V_{DS}, I_D)$ $V_{DS\text{MAX}} = V_{DD}, I_D = \frac{V_{DD}}{R_D R_{DS}}$ <p style="text-align: right;">23.3.89</p>	10	1	L3	
2	<p>Consider the common emitter amplifier under the following conditions: $V_{CC} = 5$ V, $R_{sig} = 5$ kΩ, $R_1 = 33$ kΩ, $R_2 = 22$ kΩ, $R_E = 3.9$ kΩ, $R_C = 4.7$ kΩ, $R_L = 5.6$ kΩ and $\beta = 120$. The dc collector current is shown to be $I_C = 0.3$ mA. If $C_1 = 0.1$ μF, $C_2 = 1$ μF and $C_E = 20$ μF, find the three break frequencies and an estimate for f_L.</p>	10	1	L3	
3	<p>a) Analyze the common emitter amplifier circuit given in Fig. (b) and derive the expression for the mid-band voltage gain A_M.</p> <p>b) Calculate the mid-band voltage gain (A_M) using given specifications: $R_s = 7$ kΩ, $R_1 = 60$ kΩ, $R_2 = 30$ kΩ, $R_C = 9$ kΩ, $R_E = 400$ Ω, $R_L = 7$ kΩ, $\beta = 200$, $r_x = 70$ Ω, $r_o = 120$ kΩ, $I_C = 3$ mA.</p> $A_m = -g_m R_L \left(\frac{R_B R_L}{R_{sig} + R_B R_L} \right)$ <p style="text-align: right;">23.3.89</p>	10	1	L3	
4	<p>Fig.(b)</p> <p>Derive the expression for the upper 3-dB frequency (f_H) of the common source amplifier shown in Fig (c) and also calculate its numerical value. Given $R_{sig} = 120$ kΩ, $R_G = 2$ MΩ, $C_{gs} = 2$ nF, $g_m = 4$ mA/V, $r_o = 25$ kΩ, $R_D = 10$ kΩ, and $R_L = 20$ kΩ. $f_T = 10$ MHz, $V_{DD} = V_{SS} = \pm 12$ V.</p> $f_H = \frac{1}{2\pi [C_{gs} + C_{gd} (1 + g_m R_L)]} R_{sig} \ R_{SS}$ <p style="text-align: right;">31.4.9</p>	10	1	L3	
5	<p>Consider the Class A output stage using common source circuit shown in Fig. (d). If the instantaneous output voltage swing is limited within the range of 1.8 V $\leq V_{DS} \leq 11$ V, find the quiescent parameters and the power conversion efficiency of the amplifier.</p> $V_{DQ} = \frac{V_{DS\text{MAX}} + V_{DS\text{MIN}}}{2}$ $V_P > \frac{V_{PS\text{MAX}} - V_{PS\text{MIN}}}{2} I_D$ $V_P = V_{DS\text{MAX}} - V_{DSQ}$ $I_{DS} = \frac{V_{DD} - V_{DSQ}}{R_D}$ $P_L = \frac{V_P^2}{2 P_L}$ <p style="text-align: right;">15.11.12</p> <p>Fig. (d)</p>	10	2	L3	

$$P_S = V_{DD} \cdot I_{DSQ}$$

$$\eta = \frac{P_L}{P_S} \times 100$$