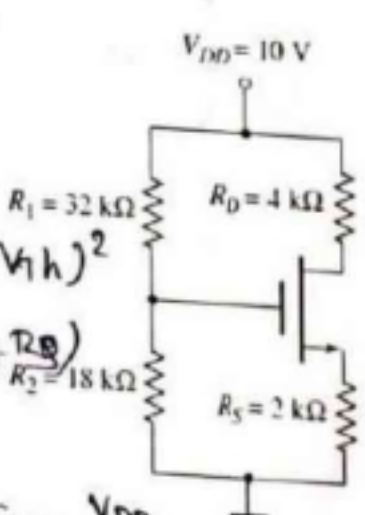
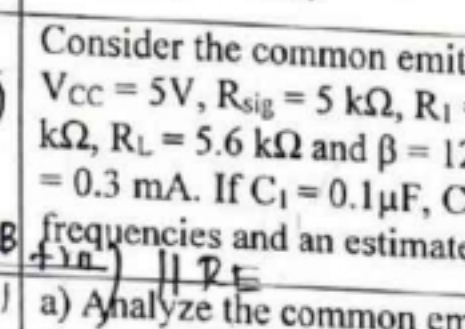
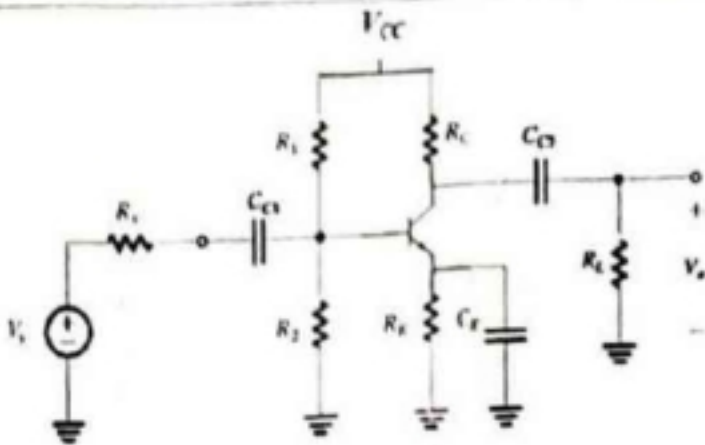
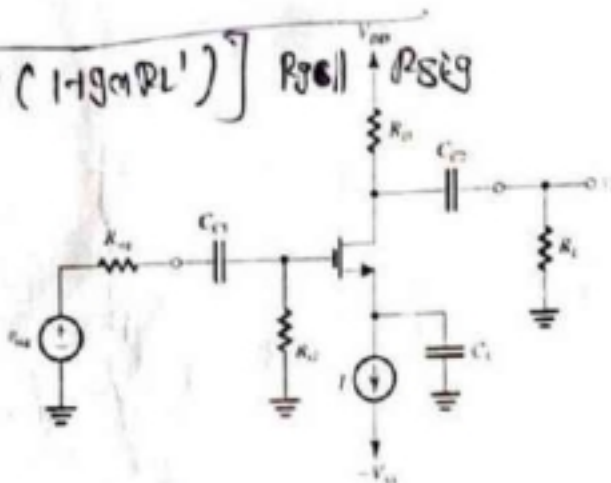
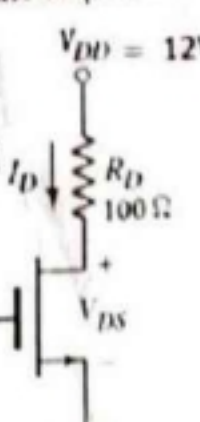


S.No.	Question	Answer all Questions	Mar ks	C O	BL
1	<p>Determine the Q point and draw the load line for the circuit in Fig. (a). The transistor parameters are $V_{TN} = 0.8 \text{ V}$, and $K_n'(W/L) = 1 \text{ mA/V}^2$.</p> <p> $V_{G1} = V_{DD} \cdot \frac{R_2}{R_1 + R_2}$ $V_{GS} = V_{G1} - V_S$ $V_S = I_D R_S$ $I_D = \frac{1}{2} K_n' (V_{GS} - V_{TN})^2$ $V_{DS} = V_{DD} - I_D (R_D + R_S)$ $Q(V_{DS}, I_D)$ $V_{DS_{max}} = V_{DD}$, $I_{DQ} = \frac{V_{DD}}{R_D + R_S}$ </p>		10	1	L3
2	<p>Consider the common emitter amplifier under the following conditions: $V_{CC} = 5 \text{ V}$, $R_{sig} = 5 \text{ k}\Omega$, $R_1 = 33 \text{ k}\Omega$, $R_2 = 22 \text{ k}\Omega$, $R_E = 3.9 \text{ k}\Omega$, $R_C = 4.7 \text{ k}\Omega$, $R_L = 5.6 \text{ k}\Omega$ and $\beta = 120$. The dc collector current is shown to be $I_C = 0.3 \text{ mA}$. If $C_1 = 0.1 \mu\text{F}$, $C_2 = 1 \mu\text{F}$ and $C_E = 20 \mu\text{F}$, find the three break frequencies and an estimate for f_L.</p> <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: $R_S = 7 \text{ k}\Omega$, $R_1 = 60 \text{ k}\Omega$, $R_2 = 30 \text{ k}\Omega$, $R_C = 9 \text{ k}\Omega$, $R_E = 400 \Omega$, $R_L = 7 \text{ k}\Omega$, $\beta = 200$, $r_x = 70 \Omega$, $r_o = 120 \text{ k}\Omega$, $I_C = 3 \text{ mA}$.</p>		10	1	L3
	<p>$A_M = -g_m R_L' \left(\frac{R_B R_L}{R_{sig} + R_B R_L} \right)$</p>		10	1	L3

	 <p>Fig. (b)</p>	10	1	L3
4	<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 $R_{sig} = 120\text{k}\Omega$, $R_G = 2\text{M}\Omega$, $C_{gs} = 2\text{nF}$, $g_m = 4\text{mA/V}$, $r_o = 25\text{k}\Omega$, $R_D = 10\text{k}\Omega$, and $R_L = 20\text{k}\Omega$, $f_T = 10\text{MHz}$, $V_{DD} = V_{SS} = \pm 12\text{V}$.</p> <p>$f_H = \frac{1}{2\pi [C_{gs} + C_{gd} (1 + g_m R_L')] R_{sig}}$</p> <p>31.49</p>  <p>Fig. (c)</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 $1.8\text{ V} \leq V_{DS} \leq 11\text{ V}$, find the quiescent parameters and the power conversion efficiency of the amplifier.</p> <p>$V_{DSQ} = \frac{V_{DS_{max}} + V_{DS_{min}}}{2}$ $V_P = \frac{V_{DS_{max}} - V_{DS_{min}}}{2}$ $V_P = V_{DS_{max}} - V_{DSQ}$ $I_{DS} = \frac{V_{DD} - V_{DSQ}}{R_D}$ $P_L = \frac{V_P^2}{2 R_L}$</p>  <p>Fig. (d)</p>	10	2	L3

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

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