Reg. No.: 22BLC1159

Name :

VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test I – September 2023

Programme	:	B. Tech (ECE/ECM)	Semester	:	FS 2023-24
Course	:	Analog Circuits	Code	:	BECE206L
			Class Nbr	:	CH2023240100353
Faculty	:	Dr. RAJU PATEL	Slot	:	E2+TE2
Time	:	90 Minutes	Max. Marks	:	50

Answer ALL the questions

Q.No.	Sub. Sec.	Questions	Marks
1.		The parameters of the transistor in the circuit shown in Figure 1 are $\beta = 100$ and $V_A = 100$ V. Find R_C such that $V_{CEQ} = 3.5$ V. Determine the small-signal voltage gain $A_v = v_o/v_s$; (i) without R_L (ii) with $R_L = 1$ kΩ.	10

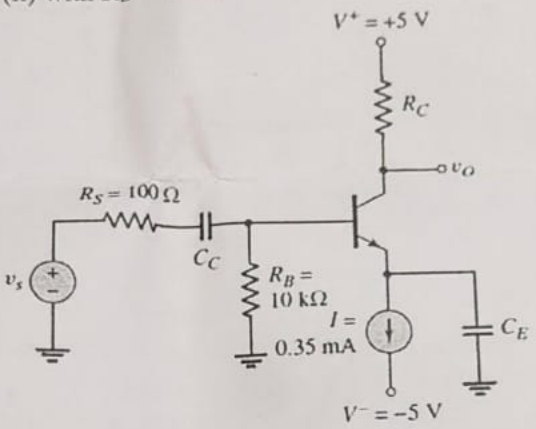
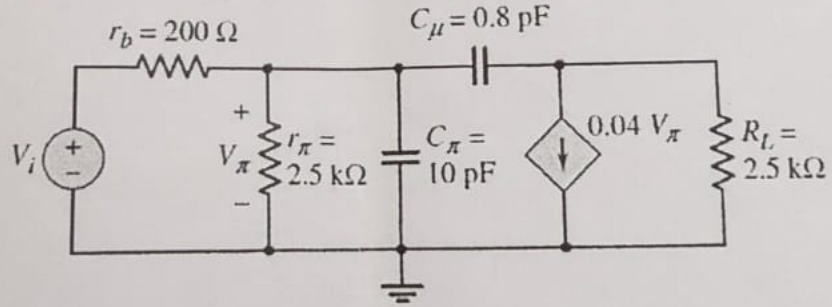


Figure 1

Consider the transistor equivalent circuit shown in Figure 2, calculate Miller capacitance and unity gain bandwidth. Using this in the CE amplifier (Circuit schematic and equivalent small signal circuit must be drawn) having $R_B = 200$ kΩ, and $R_C = 2$ kΩ, calculate the flat band voltage gain and 3 dB upper cut-off frequency.



2. **Figure 2** — 10

3. Consider the circuit shown in Figure 3. The transistor parameters are V_{TN}=1V, $K_n = 0.5$ mA/V^2. The circuit parameters are $V_{DD} = 5$ V, $R_1 = 60$ kΩ, $R_2 = 40$ kΩ, $R_D = 2$ kΩ, and $R_S = 1$ kΩ, (i) Determine V_{GS}, I_D, and V_{DS} (ii) Find $V_{DS\,(sat)}$. — 5

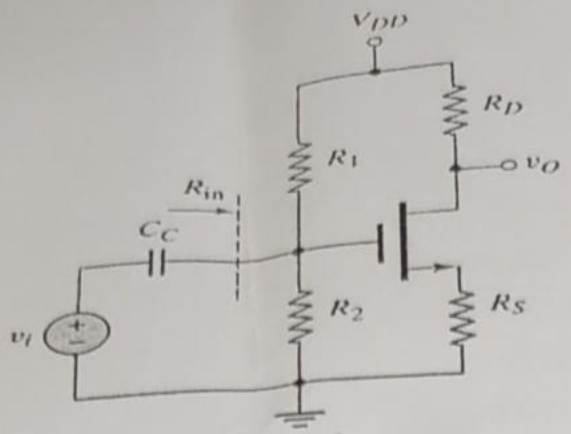


Figure 3

Consider the circuit shown in Figure 4. The transistor parameters are $V_{TN} = 1.8$ V, $K_n = 0.8$ mA/V^2, $C_{gs} = 40$ fF, $C_{gd} = 6$ fF. The circuit parameters are $V_{DD} = 10$ V, $R_1 = 400$ kΩ, $R_2 = 200$ kΩ, $R_D = 4$ kΩ, $R_i = 0.8$ kΩ and $C_c = 10$ μF.

(i) Draw the simplified high frequency model

(ii) Calculate the Miller Capacitance

(iii) Determine the upper 3dB frequency

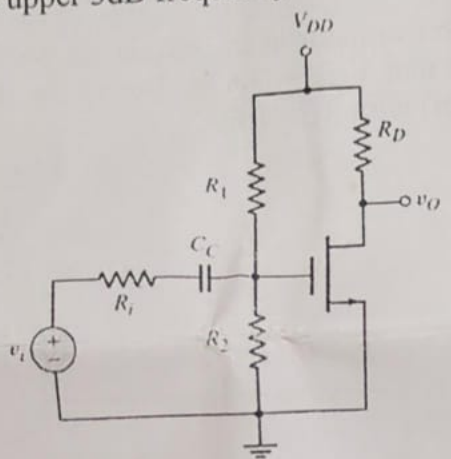


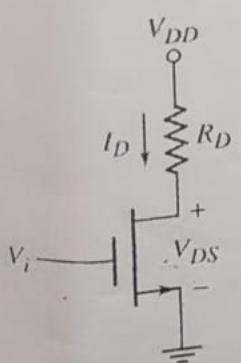
Figure 4

10

a Describe the operation of a MOSFET class A & class-AB output stage. Derive the efficiency expression for class A power amplifier. 10

Obtain the output voltage swing to minimize nonlinear distortion and calculate the maximum efficiency of a class-A power amplifier shown in Figure 5. The circuit parameters are $V_{DD} = 20$ V and $R_D = 120$ Ω, and the transistor parameters are: $K_n = 1$ A/V^2, $i_D = 28$ mA, and $\lambda = 0$.

b



5

Figure 5

Total 50

⇔⇔⇔