VIT

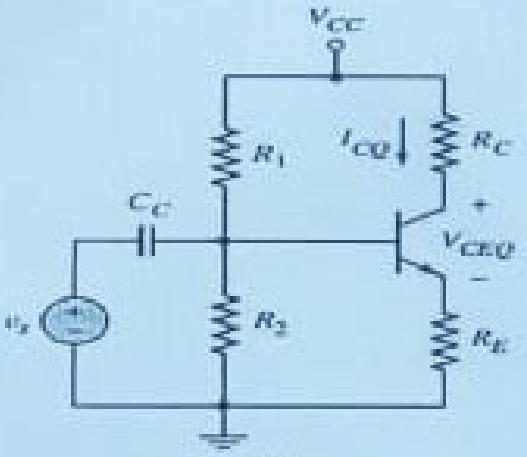
Vellore Institute of Technology

(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
			Slot	:	E1+TE1
Faculty	:	Dr SANGEETHA R G, Dr ANANIAH DURAI S, Dr SUKRITI, Dr SATHYA SREE J, Dr BINDU B	Class Nbr.	:	CH2023240100340 CH2023240100343 CH2023240100345 CH2023240100571 CH2023240100572
Time	:	90 Minutes	Max. Marks	:	50

Answer ALL the questions

Q.No.	Sub. Sec.	Questions	Marks
1.		For the circuit shown in Fig. 1, let $R_1 = 50\ k\Omega$, $R_2 = 10\ k\Omega$, $R_C = 2\ k\Omega$, $R_E = 0.5\ k\Omega$, $V_{CC} = 12\ V$, $V_{BE\,(on)} = 0.7\ V$, and $\beta = 120$. Determine the quiescent currents and voltages and mid-band voltage gain. Explain the load line characteristics and the significance of Q point.  Fig. 1	10
2		Consider the circuit shown in Fig. 2 with transistor parameters $V_{BE\,(on)} = 0.7\ V$, $\beta = 100$ and $\lambda = 0$. Let $R_1 = 50\ k\Omega$, $R_2 = 10\ k\Omega$, $R_C = 2\ k\Omega$, $R_E = 0.5\ k\Omega$, $R_S = 0.1\ k\Omega$ and $R_L = 5\ k\Omega$; (a) Draw the small signal equivalent circuit (b) Calculate the mid-band voltage gain (c) Calculate the lower cut-off frequencies if $C_c = 5\ \mu F$ and $C_L = 5\ pF$	10

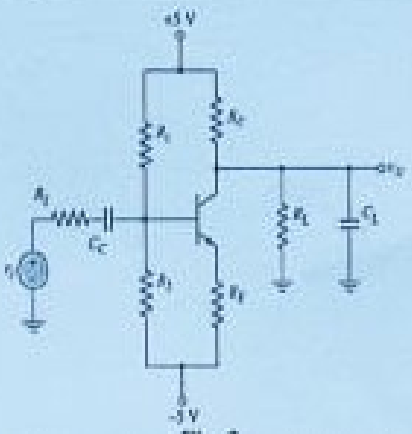


Fig. 2

For the circuit shown in Fig. 3, the transistor parameters are $K_n = 0.5$ mA/V^2, $V_{TN} = 2$ V, $\lambda = 0$, $C_{gs} = 1$ pF, and $C_{gd} = 0.1$ pF. The circuit parameters are $V_{DD} = 10$ V, $R_t = 10$ kΩ, $R_1 = 234$ kΩ, $R_2 = 166$ kΩ, $R_D = 4$ kΩ, $R_S = 0.5$ kΩ, and $R_L = 20$ kΩ. Determine:

(a) Mid-band voltage gain

(b) Miller capacitance with suitable derivations

(c) Frequency asymptotes

3 15

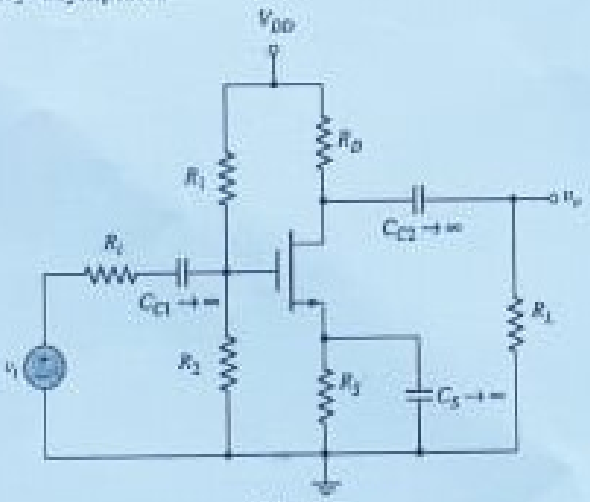


Fig. 3

4 Explain the working of the MOSFET Class B complementary push-pull power amplifier. Derive the expression for the power efficiency. 10

Calculate the actual efficiency of a class-A power amplifier shown in Fig. 4. The circuit parameters are $V_{DD} = 12$ V and $R_D = 4$ kΩ, and the transistor parameters are: $K_n = 1$ mA/V^2, $V_{TN} = 1$ V, and $\lambda = 0$. Assume $V_{DS} = 5$ V.

5 5

Fig. 4

Total 50