



# VIT

Vellore Institute of Technology

(Deemed to be University established by the Government of India)

## Continuous Assessment Test I - August 2022

Programme	: B.Tech (ECE/ECM)	Semester	: FS 2022-23
Course	: Analog Circuits	Code	: BECE206L
Faculty	: Dr.V. R Balaji	Class Nbr	: CH2022231001122
Time	: 90 Minutes	Slot	: C2
		Max. Marks	: 50

Answer **ALL** the questions

Q.No. Sub.  
Sec.

### Questions

Marks

Draw the load line and mark the Q point for the voltage divider bias circuit given below.  
Let  $R_1 = 50 \text{ k}\Omega$ ,  $R_2 = 10 \text{ k}\Omega$ ,  $R_C = 2 \text{ k}\Omega$ ,  $R_E = 0.4 \text{ k}\Omega$ ,  $V_{CC} = 12 \text{ V}$ ,  $V_{BE(on)} = 0.7 \text{ V}$  and  $\beta = 100$ .

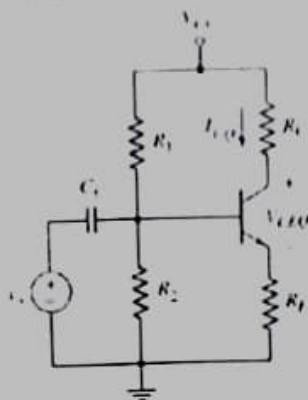


Figure.1

Consider the Equivalent circuit shown in Figure 2 and answer the following;

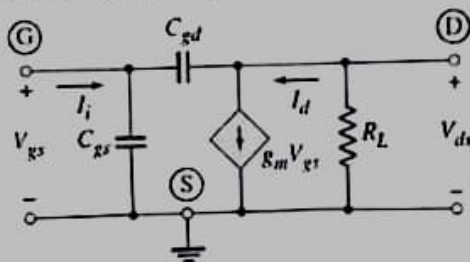
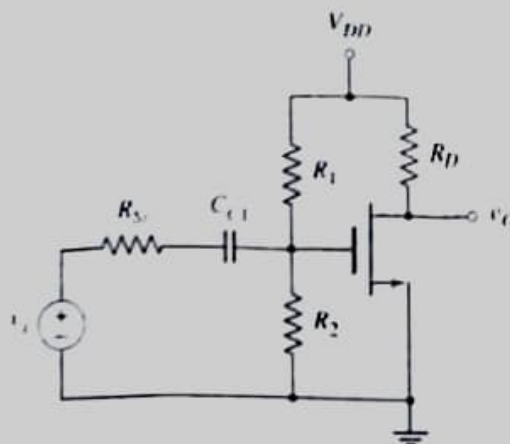


Figure.2

- Derive the miller capacitance for the circuit (5 Marks)
- Derive the cut-off frequency  $f_T$  of a MOSFET (5 Marks)

Figure 3 shows a common source amplifier, consider the parameters given and answer the following;



3.

15

Figure 3

- a
- Draw the small signal equivalent for the circuit. (3 marks)
  - Derive the expression of voltage gain  $A_v$  using small signal equivalent parameters. (7marks)

For the given circuit with

$V_{DD} = 4\text{ V}$ ;  $R_D = 11\text{ k}\Omega$ ;  $R_1 = 150\text{ k}\Omega$ ;  $R_2 = 50\text{ k}\Omega$ ;  $R_{SI} = 3\text{ k}\Omega$ ;  $V_{TN} = 0.4\text{ V}$ ;  $k_n = 0.5\text{ mA/V}^2$ ;  $\lambda = 0$ ; Find the following:

- b
- Input resistance of the amplifier circuit. (1 mark)
  - Output resistance of the amplifier circuit (1 mark)
  - Transconductance (1 mark)
  - Small signal voltage gain (2 marks)

4.

Describe the operation of an MOSFET class-B amplifier and derive the power conversion efficiency.

15

Total 50

