

(3 Hours)

[Total Marks: 80]

- N.B.: (1) Question No. 1 is compulsory.
 (2) Solve any **three questions** from the **remaining five**
 (3) Figures to the right indicate full marks
 (4) Assume suitable data if necessary and mention the same in answer sheet.

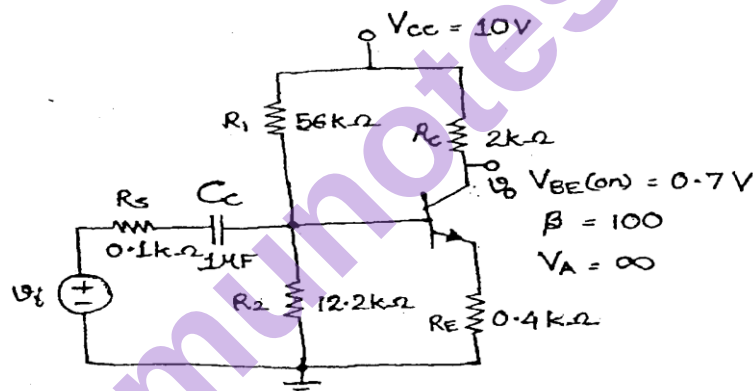
Q.1 Attempt any 5 questions

[20]

- List the characteristics of an ideal OpAmp and compare it with practical ones
- Compare power BJTs and power MOSFETS
- What is crossover distortion in power Amplifier. How it is overcome?
- Which type of biasing technique is used to bias Integrated Circuit and why?
- Draw the high frequency hybrid π equivalent circuit of a BJT and define the various components in the model.
- Explain line regulation and load regulation of voltage regulator. Draw load and line regulation characteristics of ideal and practical voltage regulator.

Q.2 a) Determine the corner frequency and maximum gain of a bipolar common emitter circuit with an input coupling capacitor.

[10]



- Determine the unity-gain bandwidth of N-channel MOSFET with parameters $K = 0.25 \text{ mA/V}^2$, $V_{in} = 1\text{V}$, $\lambda = 0$, $C_{gd} = 0.04\text{pF}$, $C_{gs} = 0.2 \text{ pF}$, $V_{GS} = 3\text{V}$. If a $10 \text{ k}\Omega$ load is connected to the output between drain and source determine the Miller capacitance and cut off frequency.

[10]

Q.3 a) For the circuit shown in fig 3 (a), transistor parameters are $K_n = 1\text{mA/V}^2$, $V_{in} = 0.7\text{V}$, $C_{gs} = 2\text{pF}$, $C_{gd} = 2\text{pF}$ and $\lambda = 0$. Find the miller capacitance, mid band voltage gain and upper cut off frequency.

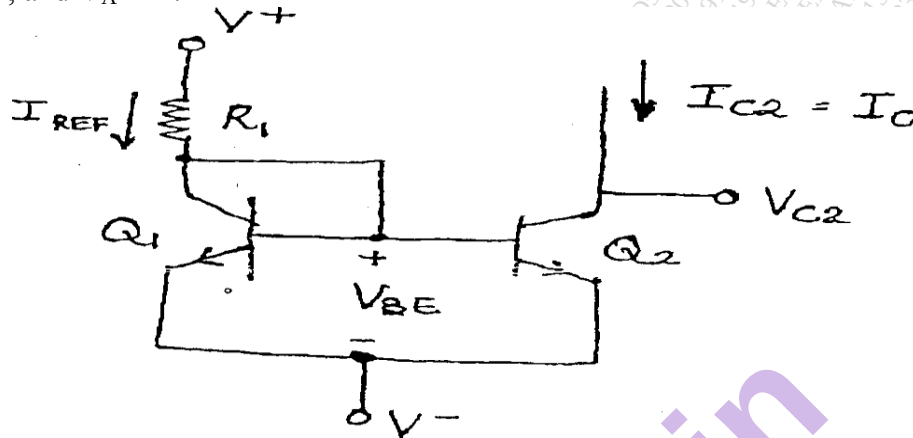
[10]

- Draw the circuit diagram of MOSFET based differential amplifier and derive the expressions for differential voltage gain, common mode gain and CMRR.

[10]

Q.4 a) Draw the circuit diagram and small signal equivalent circuit for a Darlington pair configuration. Derive the expression for its input resistance and overall current gain. [10]

b) Determine I_1 and I_0 for the two transistor current source. The circuit parameters are $V^+ = 10V$, $V^- = 0V$, $R_1 = 15\text{ k}\Omega$ and transistor parameters are $V_{BE(on)} = 0.7V$, $\beta = 75$, and $V_A = \infty$. [10]



Q.5 a) Draw the circuit diagram for transformer coupled class A power amplifier. [10]
Also draw ac and dc load lines for the same. Derive expression for power conversion efficiency.

b) Draw the circuit diagram for a summing amplifier and determine the expression of output voltage V_o , in terms of the input voltages V_1, V_2 , and V_3 , and the resistances used in the circuit. If it is desired to have $V_o = -(4V_1 + 7V_2 + 9V_3)$ find suitable values of these resistances. [10]

Q.6 Short notes on: (Attempt any four) [20]

- Power MOSFET
- Transistorized Shunt Regulator
- High pass and Low pass filter using OPAMP.
- Class AB power amplifier
- Wilson current source
