

Time: 3 hour

Max. Marks: 80

Q1 is compulsory. Attempt any three from Q2 to Q6.

- Q1 Solve any Four 5 marks each**
- A What is the effect of coupling and bypass capacitors on the frequency response of a single stage amplifier?
 - B Explain Miller's capacitance theorem.
 - C Compare BJT CE amplifier and JFET CS amplifier.
 - D What is crossover distortion in Class B power amplifiers?
 - E Explain Zener diode as a voltage regulator.

- Q2 10 Marks each**
- A Draw and explain high frequency model for BJT in CE configuration
 - B Draw and explain a series fed class A power amplifier with the help of neat diagram and waveforms and derive the expression of power efficiency.

- Q3 10 marks each**
- A Draw the voltage divider biasing circuit for JFET and derive the quiescent point (V_{DSQ}, I_{DQ}) equations.
 - B Draw a small signal equivalent circuit of an E-MOSFET CS amplifier given in fig. 1 and derive the expression for voltage gain, input resistance and output resistance.

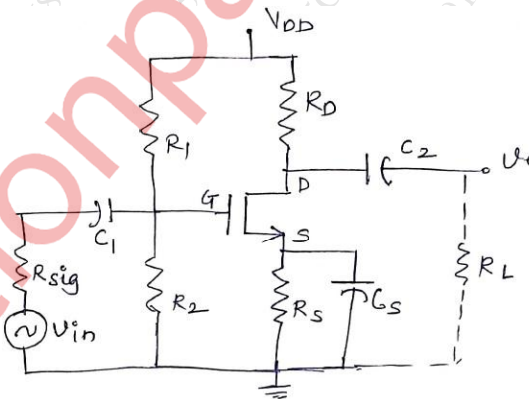


Fig. 1

- Q4**
- A Explain the operation of a semiconductor pn junction diode with the help of VI characteristics. **5 marks**
 - B What is thermal runaway and how it can be avoided? **5 marks**
 - C Calculate low cutoff frequencies due to coupling and bypass capacitors of the circuit given in fig. 2 **10 marks**

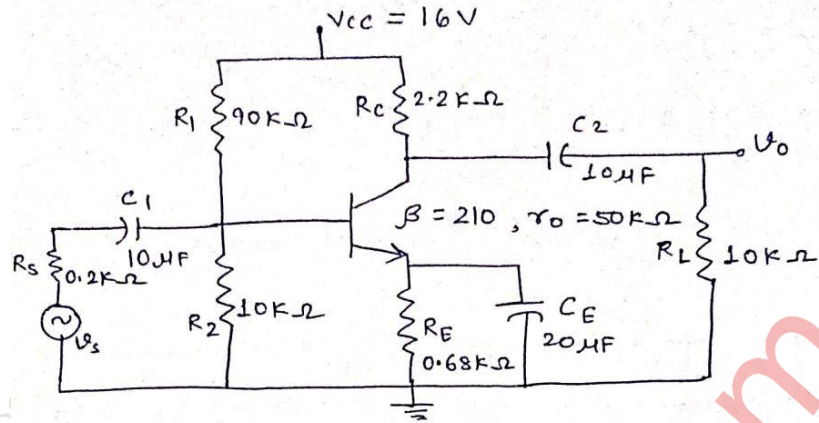


Fig. 2

Q5

10 Marks each

A

Determine f_{β} and f_T for the given circuit. Refer Fig. 3

$$R_s = 1 \text{ k}\Omega, R_1 = 40 \text{ k}\Omega, R_2 = 10 \text{ k}\Omega, R_E = 2 \text{ k}\Omega, R_C = 4 \text{ k}\Omega, R_L = 2.2 \text{ k}\Omega$$

$$C_s = 10 \mu\text{F}, C_C = 1 \mu\text{F}, C_E = 20 \mu\text{F}$$

$$h_{fe} = 100, r_o = \infty \Omega, V_{CC} = 20 \text{ V}$$

$$C_{\pi}(C_{be}) = 36 \text{ pF}, C_{\mu}(C_{bc}) = 4 \text{ pF}, C_{ce} = 1 \text{ pF}, C_{W_i} = 6 \text{ pF}, C_{W_o} = 8 \text{ pF}$$

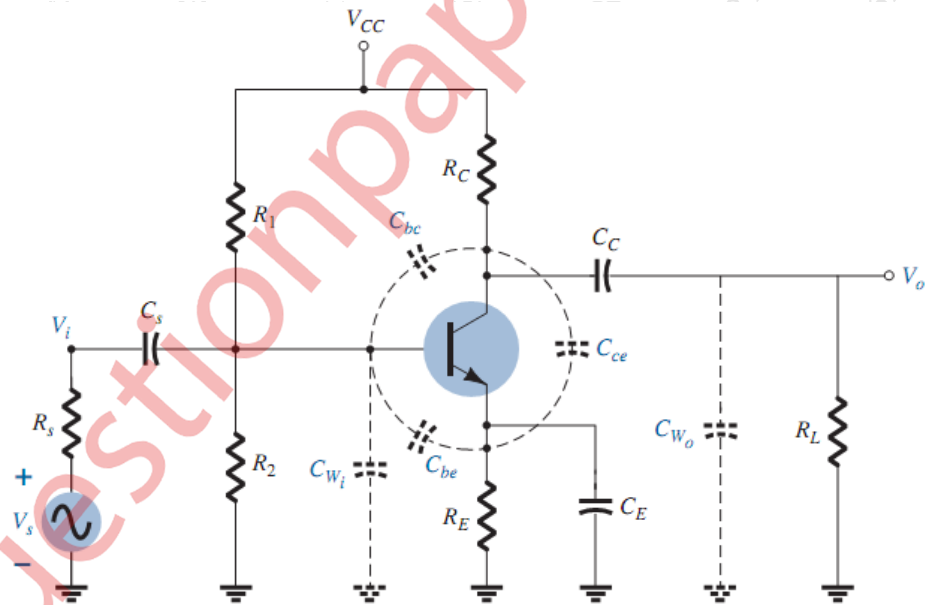


Fig. 3

- B Determine the input impedance, output impedance, voltage gain and current gain for the given circuit. Refer fig. 4

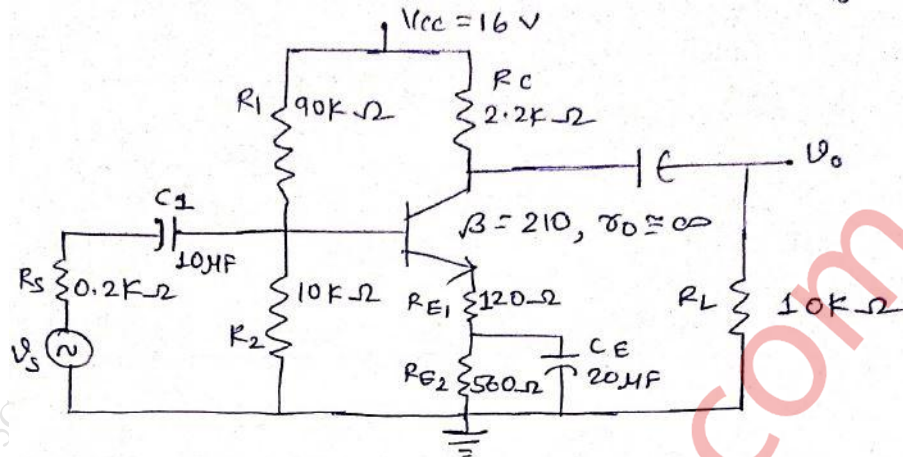


Fig. 4

Q6

10 Marks each

- A
B

Derive the equation of CMRR for the MOS differential pair amplifier.
Explain the operation of a MOS differential amplifier with differential mode input signal