**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
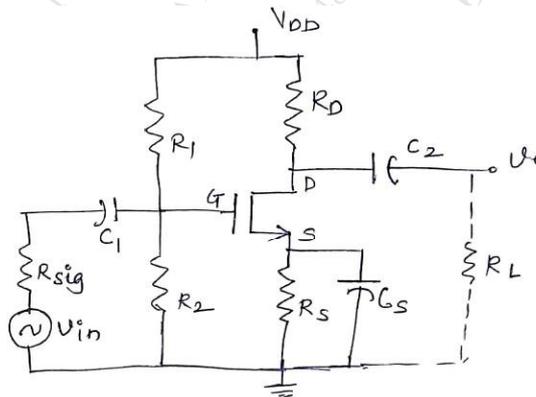      and output resistance.



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
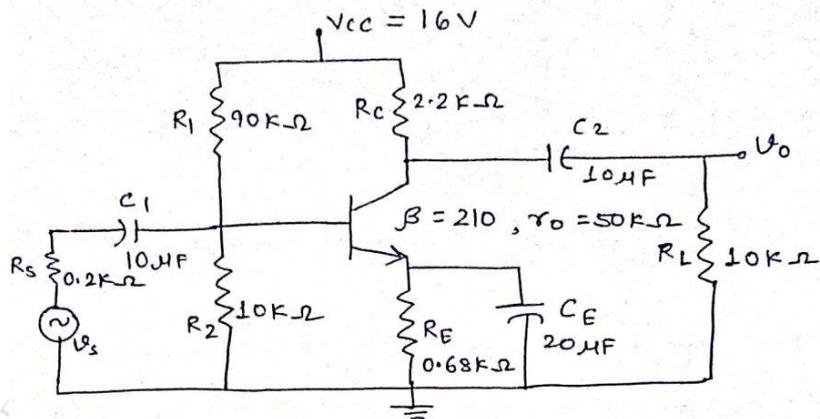      the circuit given in fig. 2                                            **10 marks**


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Fig. 2

## Q5    10 Marks each

**A**    Determine $f_\beta$ and $f_T$ for the given circuit. Refer Fig. 3

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

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

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

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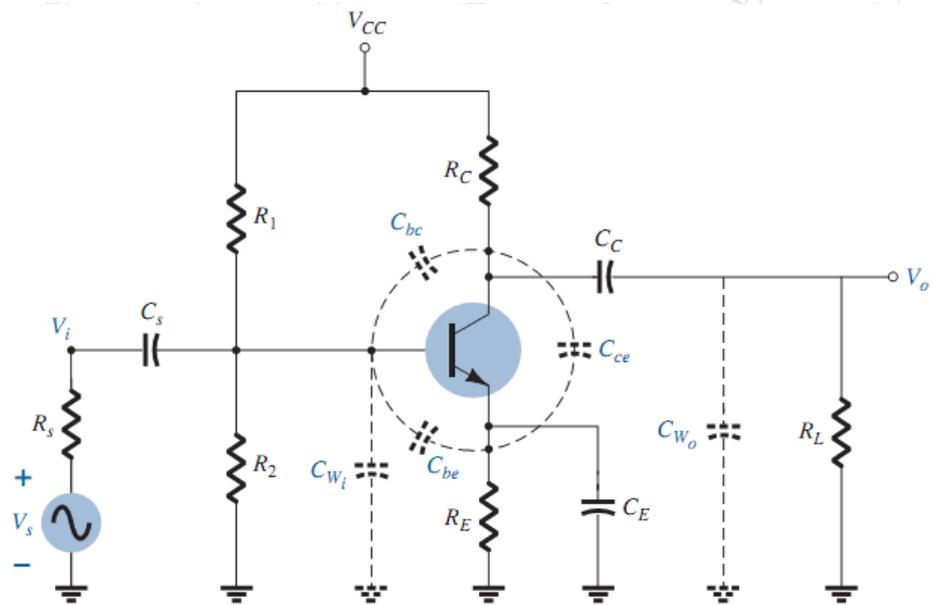


Fig. 3

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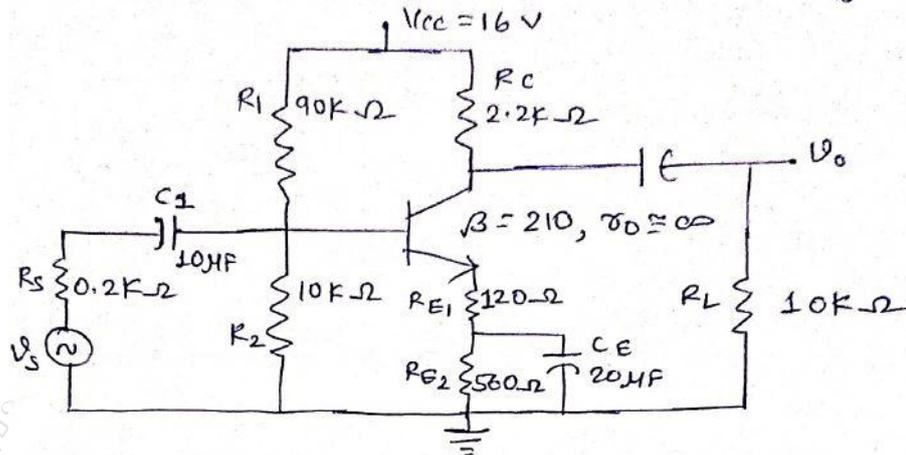


Fig. 4

## Q6      10 Marks each

A      Derive the equation of CMRR for the MOS differential pair amplifier.

B      Explain the operation of a MOS differential amplifier with differential mode input signal