(Time: 3 Hours) **[Total Marks: 80]**

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

1. (a) Draw a neat labelled diagram of Enhancement Type MOSFET and explain its operation. **20**
   (b) Explain RC Coupled Amplifier.
   (c) What is a Oscillator? Explain Basic Principle of an Oscillator.
   (d) Differentiate Class A, Class B and Class C Power Amplifiers.

2. (a) Design a two stage RC coupled CS – CE Amplifier to meet following specifications: **15**
   $A_v \geq 500$, $S \leq 8$, $R_i \geq 1\,M\Omega$, $V_{cc} = 6\,V$.
   Assume the following data: $\beta_{typ} = 290$, $h_{ie} = 4.5k\Omega$, $g_{mo} = 5000\mu\mho$, $I_{DSS} = 7mA$,
   $r_d = 50k\Omega$, $V_P = -4V$.

   (b) For a 'n' stage cascaded amplifier, show that overall lower 3 dB cut – off frequency is **05**
   $f_{LT} = \dfrac{f_L}{\sqrt{2^{1/n} - 1}}$

3. (a) With the help of neat block diagram, derive expression for R_{IF}, R_{OF}, G_{mF} for Voltage **10**
   Series Negative Feedback Amplifier. Give significance of the above mentioned parameters.

   (b) Write Short Note on: Darlington Pair Amplifier. **10**

4. (a) Find the necessary condition for oscillations to occur and frequency of oscillations of **10**
   Colpitts Oscillator. Also, explain its working.

   (b) Draw a neat diagram of Direct Coupled Class A Amplifier and explain its working. **10**
   Hence, find its efficiency.

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5. (a) Determine input impedance, output impedance, voltage gain and current gain for the given cascaded amplifier as shown in the figure below: **10**
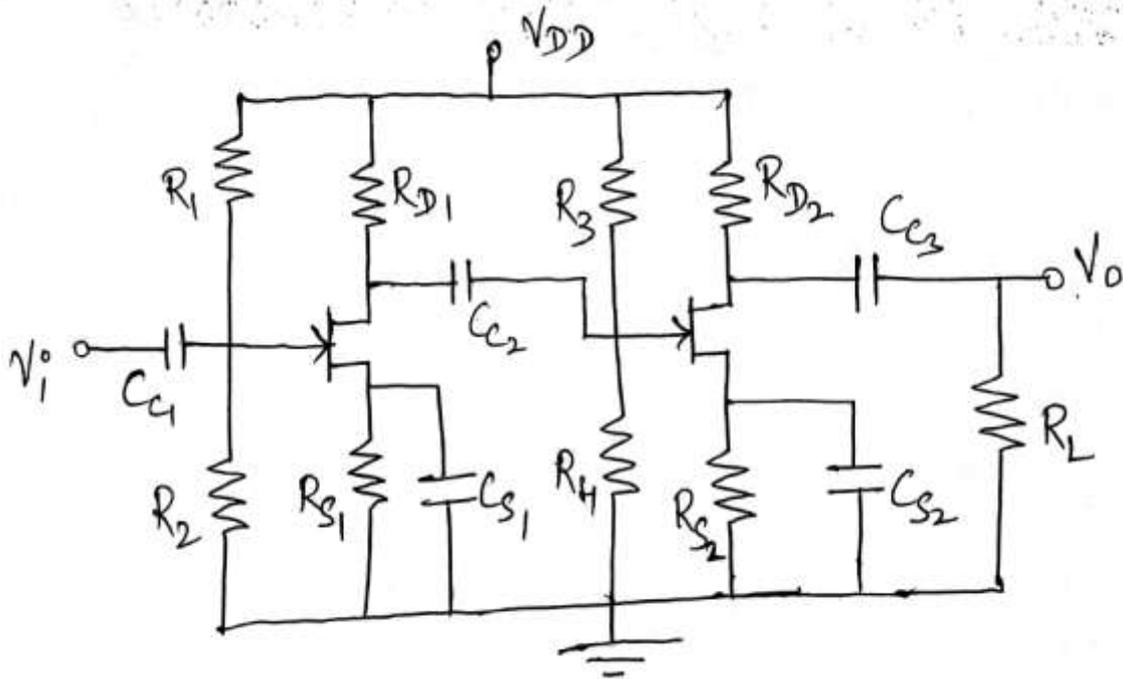
(b) Draw circuit diagram of Cascode Amplifier and explain in detail. **10**

6. (a) State and Explain different types of Biasing techniques for Depletion Type MOSFET. **08**

(b) Explain the concept of Heat Sink in detail required for Power Amplifiers. **07**
A Silicon Power Transistor is operated with a heat sink with $Q_{SA} = 1.2^{\circ}$ C/W. The transistor is rated for 120 W at 25° C and has $Q_{JC} = 0.5^{\circ}$ C/W. The mounting insulation has $Q_{CS} = 0.5^{\circ}$ C/W. What maximum power can be dissipated if the ambient temperature is 40° C and $T_{J(max)} = 200^{\circ}$ C

(c) Calculate frequency of Oscillation for Hartley Oscillator if $L_1 = L_2 = 1mH$ and $C = 0.2$ **05**
µF.

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