

(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) State biasing techniques of Enhancement Type MOSFET and explain any one technique in detail. **05**  
 (b) Explain Transformer Coupled Amplifier and give its Advantages and Disadvantages. **05**  
 (c) Define efficiency for a Power Amplifier and write the expression for the same. State the efficiency of Class A, Class B and Class C Amplifiers respectively. **05**  
 (d) Give the basic principle of an Oscillator. State the types of Oscillators. **05**
2. (a) Design a two stage RC coupled CS – CE Amplifier to meet following specifications: **15**  
 $A_v \geq 750$ ,  $S \leq 10$ ,  $R_i \geq 1 \text{ M}\Omega$ ,  $V_{cc} = 10 \text{ V}$ .  
 Assume the following data:  $\beta_{typ} = 290$ ,  $h_{ie} = 4.5 \text{ k}\Omega$ ,  $g_{mo} = 5000 \mu\text{S}$ ,  $I_{DSS} = 7 \text{ mA}$ ,  $r_d = 50 \text{ k}\Omega$ ,  $V_p = -4 \text{ V}$ .  
 (b) List various negative feedback topologies. Sketch any one topology. **05**
3. (a) Sketch Circuit Diagram, AC equivalent Model and Derive expressions for Input impedance, Output Impedance, Voltage Gain and Current Gain of a two stage CE Amplifier. **10**  
 (b) For a 'n' stage cascaded amplifier, show that overall lower 3 dB cut – off frequency is **10**  
 $f_{LT} = \frac{f_L}{\sqrt{2^{1/n} - 1}}$  and overall higher frequency is  $f_H' = f_H(\sqrt{2^{1/n} - 1})$ .
4. (a) Draw a neat diagram of Class AB power Amplifier and explain its working. **10**  
 (b) What is Cascode Amplifier? Explain in detail. **10**
5. (a) Draw RC phase shift oscillator using BJT and derive the frequency of oscillation for same. **10**  
 (b) Enumerate the effects of negative feedback on Gain, Bandwidth, Distortion, Input and Output Impedance. **10**
6. (a) Compare Small Signal and Large Signal Amplifier. **05**  
 (b) Calculate frequency of Oscillation for Hartley Oscillator if  $L_1 = 5 \text{ mH}$ ,  $L_2 = 2 \text{ mH}$  and  $C = 0.5 \mu\text{F}$ . **05**  
 (c) Explain the concept of Heat Sink in detail required for Power Amplifiers. **05**  
 (d) Sketch Symbol of n-channel and p-channel Depletion MOSFET. State giving reasons, why it is known as depletion MOSFET? **05**