

# Sem IV - ECAD - II

Biomed.

14 : 1st half, 11-AM(n)

Con. 3366-11.

Lib.

RK-1908

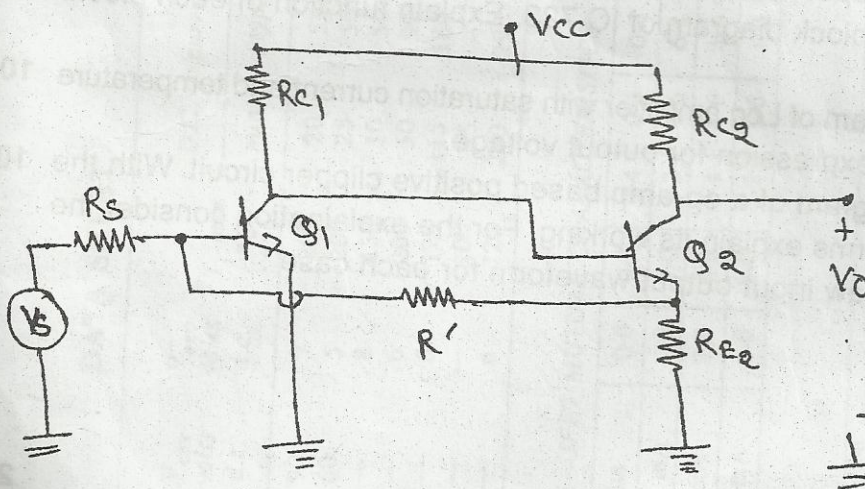
(3 Hours)

[Total Marks : 100]

- N.B. : (1) Question No. 1 is compulsory.  
 (2) Solve any four from remaining questions.  
 (3) Assume suitable data if necessary.  
 (4) Figures to the right indicate full marks.

ECAD - II Biomed.  
 sem-IV

1. (a) Compare linear and switched mode regulator in terms of efficiency, switching losses, regulation power handling capacity and size. 5
- (b) What are the important characteristics of an Ideal op-amp ? 5
- (c) State and explain Barkhausen Criterion. 5
- (d) Taking a suitable example show that non linear distortion reduces due to negative feedback. 5
2. (a) Identify the type of feedback in the following circuit. Find  $A_{vf}$ ,  $R_{if}$ , the resistance seen by the voltage source and the output resistance. 12



$$h_{fe1} = h_{fe2} = h_{fe}$$

$$h_{ie1} = h_{ie2} = h_{ie}$$

Given :

$$R_{C1} = 3k\Omega \quad R_{C2} = 500\Omega$$

$$R_{E2} = 50\Omega \quad R' = 1.2k\Omega$$

$$R_S = 1.2k\Omega \quad h_{fe} = 50, h_{ie} = 1.1k\Omega$$

$$h_{re} = h_{oe} = 0 \quad [\text{For both transistors}]$$

$$V_{CC} = 20V$$

- (b) For a three pole amplifier neatly draw magnitude and phase plot. Explain concept of Miller Compensation. 8
3. (a) Design a class A transformer coupled power amplifier for the following requirements 12

$$\text{o/p ac power} = 5W$$

$$\text{Load resistance} = 12\Omega$$

$$V_{CC} = 12V$$

$$S_{LCO} \leq 8$$

Calculate overall efficiency at full load.



- (b) What is the need of heat sinks ? For a power MOSFET the thermal resistance parameters are as follows. 8

$$Q_{\text{dev} - \text{case}} = 1.75^\circ\text{C/W}$$

$$Q_{\text{case} - \text{sink}} = 1^\circ\text{C/W}$$

$$Q_{\text{sink} \rightarrow \text{amb}} = 5^\circ\text{C/W}$$

$$Q_{\text{case} - \text{amb}} = 50^\circ\text{C/W}$$

$$T_{\text{amb}} = 30^\circ\text{C} \quad T_{\text{jmax}} = T_{\text{dev}} = 120^\circ\text{C}$$

Draw electrical equivalent circuit for heat flow from device to ambience. Find  $\text{Max}^m$  power dissipation in the transistor when no heat sink is used and when heat sink is used.

4. (a) Draw a neat circuit diagram of a Wienbridge oscillator using op-amp. Explain its working. Derive expression for frequency of oscillation and condition for sustained oscillation. 10
- (b) Draw a neat block diagram of operational amplifier. Explain each block in detail. 10
5. (a) What are the different types of switching regulators ? Explain operation of each regulator by drawing proper circuit diagram. 12
- (b) Draw a neat functional block diagram of IC 723. Explain function of each block. 8
6. (a) Draw a neat circuit diagram of Log amplifier with saturation current and temperature compensation. Derive expression for output voltage. 10
- (b) Draw a neat circuit diagram of a op-amp based positive clipper circuit. With the help of suitable waveforms explain its working. For the explanation consider the following cases and draw input output waveform for each case : 10
- $V_{\text{ref}} = 0$
  - $V_{\text{ref}} > 0$
  - $V_{\text{ref}} < 0$
7. Write short notes on following (any two) :— 20
- Three op-amp Instrumentation amplifier
  - Full wave precision rectifier
  - Practical Integrator
  - Class A-B pushpull amplifier.