

Roll No.:

National Institute of Technology, Delhi

Name of the Examination: B. Tech. / M. Tech. / Ph.D.

Branch : ECE/EEE Semester : III/V
Title of the Course : Analog Electronics Course Code : EC 220
Time: 3 Hours Maximum Marks: 50

Note : All parts of section A are compulsory and carrying of 01 mark each.

Attempt any 4 questions from Section B each carrying 5 marks.

Attempt any 2 questions from section C each carrying of 10 marks.

Section A

- Q 1. (a) Why power amplifier is always preceded by a voltage amplifier? (1X10)
- (b) What is crossover distortion. How it is minimized.
- (c) Differentiate between Direct Coupled, RC and Transformer coupled amplifier.
- (d) Define three stability factors for a transistor.
- (e) What is minority carrier current?
- (f) What is the condition for avalanche breakdown to occur?
- (g) What is early effect?
- (h) What is thermal drift?
- (i) Explain the effect of coupling capacitor and bypass capacitor on the voltage gain of an amplifier.
- (j) What are the advantages of negative feedback.

Section B (4X5)

Q 2. Draw the hybrid equivalent circuit for common base configuration and find the expression for current gain, voltage gain, input impedance, output impedance and power gain.

Q 3. A Class B push pull amplifier is supplied with $V_{CC} = 50V$. The signal swings the collector voltage down to $V_{min} = 5V$. The total dissipation in both transistors is 40 W. Find the total power and conversion efficiency.

Q 4. Explain the effect of negative feedback on input impedance, output impedance, voltage gain and bandwidth in current shunt feedback topology.

Q 5. Give DC and AC analysis of single input balanced output differential amplifier and derive expressions of the operating current and voltage, input and output resistance and voltage gain.

Q 6. Derive the expression of frequency and gain of the RC Phase Shift Oscillator.

Section C

(2X10)

Q 7. (a) A CB transistor amplifier uses a voltage source of internal $R_s=200$ ohm and the load resistance is $R_L=1200$ ohm. The h parameters are $h_{ib}=24$ ohm, $h_{rb}=4 \times 10^{-4}$, $h_{fe}=-0.98$ and $h_{ob}=0.6\mu\text{A/V}$. Calculate the following:

(i) Current gain (ii) Voltage gain (iii) input impedance (iv) output impedance (v) Overall current gain (vi) Overall voltage gain

(b) The following low frequency parameters are known for a given transistor at $I_c=10$ mA and $V_{CE}=100$ V and at room temperature $h_{ie}=500$ ohm, $h_{oe}=10^{-5}\text{A/V}$, $h_{fe}=100$ and $h_{re}=10^{-4}$. At the same operating point $f=10$ MHz and $C_c=3$ pF. Calculate the values of all hybrid π conductance parameters and emitter junction capacitance.

Q 8. (a) (i) Explain the working of an emitter follower and show how it performs the function of impedance transformation.

(ii) An emitter follower has voltage gain of 0.99. Determine β for the transistor.

(b) Draw the general block diagram of a feedback amplifier. Derive the gain analysis in a feedback amplifier. From the gain analysis, show the Brackhausen criteria for self sustained oscillations.

Q 9. (a) Discuss Class A power amplifier with output transformer as a load. Discuss its working and find an expression for its efficiency.

(b) Derive the expressions of stability factors with respect to I_{CO} , β and V_{BE} for emitter bias circuit.