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 x 10^{-4}, h_{fe}=-0.98 and h_{ob}=0.6μA/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}=100V and at room temperature h_{ie}=500 ohm, h_{oe}=10^{-5}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 junctiuon 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.