Code No: NR221401 **NR**

II B.Tech II Semester Supplementary Examinations, Apr/May 2006
ELECTRONIC DEVICES AND CIRCUITS
(Mechatronics)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Mention the forward current equation of a semiconductor diode and briefly explain various terms in the equation.
   (b) Draw the forward characteristic of the semiconductor diode and explain the nature of variation with reference to the equation for forward current of the diode.
   (c) The current through silicon diode, I_f =60 ma for a forward bias of V_f =0.6 Volts. Calculate the static resistance.
   (d) Discuss the features that are responsible for maintaining constant voltage across the load in simple voltage regulator circuits using a Zener diodes. [4x4]

2. (a) Draw the Half wave rectifier circuit using a step down Transformer with V_S = 46 sin(ω t) and a semiconductor diode. Calculate the turns ratio of the Transformer windings when the primary voltage of the Transformer is 230 volts.
   (b) Explain the working of the Half wave rectifier circuit using signal waveforms at various points in the circuit.
   (c) Calculate the magnitude of the ripple factor for the given set of observations of $V_{A.C}$ = 24.2 volts and $V_{D.C}$ = 20 volts. Identify the type of rectifier circuit based on the knowledge of theoretical values of ripple factors for Half wave and Full wave rectifier circuits. [6+6+4]

3. (a) Draw a NPN Transistor circuit in common emitter configuration with biasing voltages so that the Transistor can be used as an amplifying device.
   (b) Discuss the flow of various currents in a NPN Transistor in Common Emitter mode.
   (c) Draw the input and output characteristics of a Common Emitter operated Transistor.
   (d) Show the various regions of operation on the output characteristics of a CE Transistor and explain their significance in the use of Transistor as an amplifying device. [3+3+4+6]

4. (a) A BJT has the parameters. h_{ie} = 2000 ohms, h_{re} = 2.5x10^{-4}, h_{fe}=50 and h_{oe} = 25x10^{-6} mhos. Determine input resistance, current gain, voltage gain and output resistance of the CE Transistor amplifier, if the load resistance R_L = 10 K Ω.

(b) Discuss the phenomenon of 'Thermal Run Away' in Transistors and discuss the measures used for limiting its occurrence. [8+8]

5. (a) Explain the concepts for arriving at the hybrid-π equivalent circuit model of Common Emitter amplifier at high frequencies.

   (b) Explain the different parameters used in the above hybrid-π equivalent circuit indicating the methods of arriving at the various expressions for the parameters used in the circuit. [8+8]

6. (a) Draw the potential divider bias circuit for P-Channel JFET and explain the function of each component in the circuit.

   (b) Derive the expression for voltage gain of JFET model for self bias configuration. [8+8]

7. (a) Enumerate the various reasons for changes in gains of electronic amplifiers.

   (b) Derive the expression for the reduction of relative change in gain in negative feedback amplifier compared to that without feedback.

   (c) If an amplifier with a gain A_V of 1000 and feedback factor β = -0.2 has again change of 25% due to changes in temperature. Calculate the change in gain of the feedback amplifier.

   (d) With suitable expressions for voltage gain, describe the role of by-pass capacitor in a conventional CE amplifier using BJT. Also mention the type of feedback. [4x4]

8. (a) Draw a feedback circuit used as an oscillator, using a block diagram and explain the oscillator operation with necessary details

   (b) Discuss the Barkhausen Criterion for maintaining oscillations in an oscillator circuit.

   (c) Draw the circuit of RC phase shift oscillator and explain its working. [5+5+6]

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