Subject :Electronic Devices and Circuits

Subject Code : ECE303

L   T   P   **Full Marks- 100 (80+20)**

3   2

1.   **SEMICONDUCTOR & PN Junction Diodes :**   **(10 hrs)**
     Difference between Conductor, Insulator and Semiconductor, Mobility and conductivity, Charge densities in a semiconductor, Fermi Dirac distribution,   Carrier concentrations and Fermi levels in semiconductor, Generation and recombination of charges, Diffusion and continuity equation,   P and N Type semiconductor, Formation of homogenous and hetrojunction diodes and their energy band diagrams, PN Junction, V-I characteristics, Small signal models of diode, Diode as a circuit element, Diode parameters and load line concept,   Applications of diodes in rectifier, Clipping, Clamping circuits and voltage multipliers,   Breakdown diodes, Schottky diodes, and Zener diode as voltage regulator

2.   **TRANSISTORS :**   **(06 hrs)**
     Characteristics, Current components, Current gains: alpha and beta. Variation of transistor parameter with temperature and current level, Operating point, Hybrid model, DC model of transistor, h-parameter equivalent circuits. CE, CB and CC configuration. DC and AC an analysis of single stage CE, CC (Emitter follower) and CB amplifiers AC & DC load line, Ebers-Moll model. Biasing & stabilization techniques. Thermal runaway, Thermal stability.

3.   **JFET & MOSFET :**   **(06 hrs)**
     Construction and operation, Noise performances of FET, Parasitic of MOSFET, Small signal models of JFET & MOSFET, Biasing of JFET's & MOSFET's, Low frequency single stage CS and CD (source follower) JFET amplifiers, FET as voltage variable resistor and FET as active load, CMOS.

4.   **SMALL SIGNAL AMPLIFIERS :**   **(06 hrs)**
     Analysis of BJT and FET multistage amplifier, DC and RC coupled amplifiers. Frequency response of single and multistage amplifier, mid-band gain, gains at low and high frequency. Analysis of DC and differential amplifiers, Cascade and cascade configuration of multistage amplifiers (CE-CE, CE-CB, CS-CS and CS-CD), Darlington pair

5.   **FEEDBACK AMPLIFIERS & Oscillators :**   **(06 hrs)**
     Classification, Feedback concept, Feedback Topologies, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of voltage-series, voltage-shunt, current-series and current-shunt feedback amplifier. Stability criterion.
     OSCILLATORS- Classification. Criterion for oscillation. Tuned collector, Hartley, Colpitts, RC Phase shift, Wien bridge and crystal oscillators, pulse generator.

6.   TUNED AMPLIFIER :   **(06 hrs)**
Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET, Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse Response of such Amplifier, class C tuned amplifiers, Shunt Peaked Circuits for Increased Bandwidth.(Discussion and use as RF and IF stages)

7.   POWER AMPLIFIERS –   **(06 hrs)**
Classification, Power transistors & power MOSFET (DMOS, VMOS). Output power, power dissipation and efficiency analysis of Class A, class B, class AB, class C, class D and class E amplifiers as output stages. Push pull amplifiers with and without transformers, Complementary symmetry & quasi complimentary symmetry amplifiers

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List of experiments

1. Study the following devices: (a) Analog & digital multimeters (b) Function/ Signal generators (c) Regulated d. c. power supplies (constant voltage and constant current operations) (d) Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
2. Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.
3. Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
4. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product
5. Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss & Vp
6. Application of Diode as clipper & clamper
7. Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
8. Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
9. Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters
10. Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor.
11. Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.
12. Oscillator circuits