EC-404 Electronic Circuits

Unit-I

Amplifier Basics, Transistor as an amplifier, load line, Q-point and its selection criteria, designing of fixed bias and self-bias, stability of biasing circuits, calculation of stability factor.

Transistor at low frequency: frequency response, bandwidth, h-parameter analysis of CC, CB and CE configuration, simplified model, gain and impedance calculation of single stage amplifier.

Transistor at high frequency, high frequency model (hybrid-π), Parameters and their definition, Miller capacitance and its effect on voltage gain,

Unit-II

Feedback amplifier: positive and negative feedback loop gain, effect of negative feedback on gain stability, distortion, bandwidth, input and output impedance of amplifier, types of feedback (voltage, current, series and shunt) and their analysis.

Oscillators: condition of sustained oscillation, RC phase shift, LC (Hartley and Collpit) Oscillators, Wein Bridge, Negative resistance (Tunnel diode and UJT) oscillators, crystal oscillators.

Unit III

Power amplifier, classification, operation, analysis and design of Class A, Class B, Class-AB, Class C, transformer coupled, push pull and complementary symmetry amplifiers, power dissipation in transistors (Pdmax rating) and efficiency calculations.

Tuned amplifier and its applications, Q factor, selectivity and bandwidth, effect of loading, double tuning (synchronous and stagger)

Unit IV

Cascade amplifiers, Calculation of gain, Input and output impedance, Effect of Cascading on bandwidth, Transformer, RC and direct-coupled amplifier and their performance.

Darlington connection, equivalent circuit and Calculation of gain and impedances, Cascade amplifier: advantage,

circuit diagram and analysis, feedback pair and applications of BIFET, Bootstrapping technique.

Differential amplifier - configuration, transfer characteristics, DC analysis, h-parameter analysis, differential and common mode gain, CMRR, constant current source and current mirror, level shift.

Unit-V

Operational amplifier (IC741), specifications, ideal and practical characteristics, frequency response, unity gain bandwidth, limitations, slew rate and its effect on full power bandwidth, input offset voltage, bias and offset currents, compensation.

Applications of Op-Amp: Inverting and non-inverting amplifier Analog computation, summer (inverting and non- inverting), averager, integrator, differentiator, scalar, sign changer, phase changer, multiplier, buffer, Differential amplifier, instrumentation amplifier, comparator, Schmitt trigger, precision rectifier, log and antilog amplifier,voltage-to-current and current-to-voltage converter.

References:

1. Millman and Halkias : Integrated electronics, TMH
2. Gayakwad ; OPAMP and Linear Integrated Circuits, Pearson Education
3. Boylestad and Nashelsky : Electronic Devices and Circuit Theory, PHI
4. Sendra and Smith : Microelectronics, Oxford Press
5. Graham Bell : Electronic Devices and Circuits , PHI
6. Donald A Neamen : Electronic Circuits Analysis and Design, TMH

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be tested on the bread board

Step 3: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Characteristics of Op-Amp (input offset voltage, slew rate, CMRR, BW, input bias current.
2. Linear application of Op-Amp (voltage follower, inverting and non-inverting amplifier and their frequency response, adder, substractor, differential amplifier, integrator and differential frequency response)
3. To design and construct a shunt and series regulator and find line and load regulation.
4. Design and performance evaluation of transistor amplifiers in CE, CB and CC configuration
5. Design and performance evaluation of FET amplifiers.