

II Year II Semester
Code: 17EC401

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ELECTRONIC CIRCUIT ANALYSIS

Course Objectives:

The main objectives of this course are:

1. Small signal high frequency BJT transistor amplifier Hybrid- π equivalent circuit and the expressions for conductance and capacitances are derived.
2. Cascading of single stage amplifiers is discussed. Expressions for overall voltage gain are derived.
3. The concept of feedback is introduced. Effect of negative feedback on amplifier characteristics is explained and necessary equations are derived.
4. Basic principle of oscillator circuits is explained and different oscillator circuits are given with their analysis.
5. Power amplifiers Class A, Class B, Class C, Class AB and other types of amplifiers are analyzed.
6. Different types of tuned amplifier circuits are analyzed.

UNIT-I: Small Signal Low Frequency Transistor Amplifier models

Single Stage Amplifiers: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, comparison of transistor amplifiers. Generalized analysis of small signal model of FET, analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Multistage Amplifiers: Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower. Analysis of multi stage amplifiers using FET, Differential amplifier using BJT.

UNIT-II: Small Signal High Frequency Transistor Amplifier models

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT –III: Feedback Amplifiers

Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

Unit-IV: Oscillators

Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and FET and their analysis, Frequency and amplitude stability of oscillators.

UNIT-V Power Amplifiers

Classification of amplifiers, Class A power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Distortion in amplifiers.

UNIT-VI: Tuned Amplifiers

Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, effect of cascading single tuned amplifiers on band width, effect of cascading double tuned amplifiers on band width, staggered tuned amplifiers, stability of tuned amplifiers, wideband amplifiers.

Text Books:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata McGraw-Hill, 1972.
2. Electronic Devices and Circuits- Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

References:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, McGraw Hill.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall,
3. Tenth Edition.
4. Electronic Circuit Analysis-B.V.Rao,K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, Pearson Publications.
5. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.

Course Outcomes:

At the end of this course the student can able to:

1. Derive and analyze the expressions for conductance and capacitances of the small signal high frequency transistor amplifier using BJT and FET.
2. Derive and analyze the expressions for overall voltage gain of multi stage amplifiers using BJT and FET and Differential amplifier using BJT
3. Derive and analyze the expressions for necessary equations of feedback amplifiers
4. Derive and analyze the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators.
5. Derive and analyze the different types of power amplifiers
6. Derive and analyze the different types of tuned amplifiers