

Paper-III: 2230 ELECTRONICS

Unit I

Basic circuit analysis:

Voltage and current sources, Open and Short Circuits, Kirchoff's laws, Voltage and current divider rules, Mesh and node analysis, Principle of superposition, Thevenin's and Norton's theorem, Maximum Power transfer theorem.

Semiconductor diodes:

p-n junction diodes, I-V characteristics, diode as a rectifier, half wave, full wave and bridge rectifiers, clippers and clampers, Zener, varactor diode and their applications, Optoelectronic diodes: LED and Photodiodes.

Bipolar Junction Transistors (BJT):

Basic construction of pnp and npn transistors and their operation, Input and output characteristics of CB, CE and CC configurations, Biasing methods, active, saturation and cutoff regions, load line concepts, Graphical analysis of CE configuration and phase relationship.

Field effect transistors:

Basic constructions of JFET and MOSFET, Drain characteristics of JFET, biasing of JFET, operating regions, pinch-off voltage.

Unit II

Small signal amplifiers:

General amplifier characteristics, Two port analysis of a transistor, definition of h-parameters, current gain, voltage gain and power gain of an amplifier, Input and output resistances, Analysis of CB, CE and CC amplifiers for current gain, voltage gain, input and output impedences using h – parameters, Decibel power, Classifications of amplifiers, class A, B, AB and C amplifiers (graphical treatment only), RC coupled transistor amplifier, Gain frequency response, and high frequency limitations. Transformer coupled amplifier.

Unit III

Feed back amplifiers:

Basics of Negative feedback, Merits and demerits of negative feedback and its applications, Voltage series amplifier (Emitter follower) and Current series amplifier (CE amplifier with and without bypass capacitor).

Oscillators:

Positive feedback, Barkhausen criterion, Phase shift oscillator, Colpitt's and Hartley oscillators, and Crystal oscillator.

Operational Amplifiers:

Characteristics of Operational amplifiers, circuit symbols, ideal and practical op-amp, Inverting and noninverting configurations, Applications of OP-AMP as an adder, subtractor, inverter, scale changer, phase shifter, differentiator and integrator.

Unit IV

Digital Electronics:

Binary, Octal, decimal and hexadecimal numbers and their inter conversions, 1's and 2's complements of binary numbers, addition and subtraction of binary numbers, OR, AND, NOT, NAND, NOR and XOR gates and their symbols and truth tables, Boolean algebra, DeMorgan's theorem, minterms and maxterms, sum of minterms and product of maxterms forms of Boolean functions, simplifications of Boolean function using Karnaugh's map (up to 4-variables).

Unit V**Modulation:**

Basics of modulation, amplitude and frequency modulation, sidebands, Comparison between AM and FM, power of amplitude modulation and spectrum, AM and FM transmitters (Block diagram and principle of operation only).

Demodulation:

Demodulation of AM and FM waves, linear envelope detector, Hetrodyne and superhetrodyne receiver (Block diagram and principle of operation only).

Cathode Ray Oscilloscope:

Cathode ray tube- theory and construction, Cathode Ray Oscilloscope (Block diagram and operation), Application of CRO, wave form display, frequency, phase and amplitude determination, Lissajous figures.

Recent developments in Physics including discussion of Nobel prizes in Physics (no questions to be set in the theory examination).

Text Books:

1. Foundations of Electronics by D. Chattopadhyaya, P.C. Rakshit, B. Saha and N.N. Purkait (New Age International (P) Limited Publishers).
2. Electronic Devices and Circuit theory by R. Boylestead and L. Nashelsky (Prentice Hall of India).
3. Electronics (in Hindi) by Bhandari and Kakani

Reference books

1. Electronic Devices by Allan Mottershed (Prentice Hall of India).
2. Digital fundamentals by Thomas L Floyd (Unuited Book Stall, New Delhi).
3. Electronic fundamentals and applications by John D. Ryder (Prentice Hall of India).
4. Electricity and Magnetism by K.K. Tewari (S. Chand &Company Limited).