

PHYSICS-'39: PHYSICS OF DEVICES AND INSTRUMENTS

UNIT-1

Devices: Characteristic and Equivalent Circuits of UJT and JFET. Metal-semiconductor and metal oxide semiconductor junctions. MOSFET– their frequency limits. Enhancement and Depletion Mode MOSFETS, Charge coupled devices. (13 Lectures)

UNIT-2

Power supply and Filters: Block Diagram of a Power Supply, Qualitative idea of C and L Filters. IC Regulators, Line and load regulation, Short circuit protection (3 Lectures)

Active and Passive Filters, Low Pass, High Pass, Band Pass and band Reject Filters. (4 Lectures)

Multivibrators: Astable and Monostable Multivibrators using transistors. (2 Lectures)

Phase Locked Loop (PLL): Basic Principles, Phase detector (XOR and edge triggered), Voltage Controlled Oscillator (Basics, varactor). Loop Filter – Function, Loop Filter Circuits, transient response, lock and capture. Basic idea of PLL IC (565 or 4046). (4 Lectures)

UNIT-3

Transducers and Sensors (Working principle, efficiency, applications): Active and passive transducers. Characteristics of Transducers. Transducers as electrical element and their signal conditioning. Temperature transducers: RTD, Thermistor. Position transducer: Strain gauge, Piezoelectric transducer. Inductance transducer: Linear variable differential transformer (LVDT), Capacitance transducer. Magnetoresistive transducer. Radiation Sensors: Principle of gas filled detector, ionization chamber, scintillation detector. (10 Lectures)

UNIT-4

Introduction to communication systems: Block diagram of electronic communication system, Need for modulation. Amplitude modulation. Modulation Index. Analysis of Amplitude Modulated wave. Sideband frequencies in AM wave. CE Amplitude Modulator. Demodulation of AM wave using Diode Detector. basic idea of Frequency, Phase, Pulse and Digital Modulation including ASK, PSK, FSK. (12 lectures)

Reference Books:

- Physics of Semiconductor Devices, S.M. Sze & Know K. Ng, 3rd Ed., 2008, John Wiley and Sons
 - Electronic devices and integrated circuits, Ajay Kumar Singh, 2011, PHI Learning Pvt. Ltd.
 - Op-Amps & Linear Integrated Circuits, R.A.Gayakwad, 4th Ed., 2000, PHI Learning Pvt.Ltd.
 - Electronic Devices and Circuits, A. Mottershead, 1998, PHI Learning Pvt. Ltd.
 - Electronic Communication systems, G. Kennedy, 1999, Tata McGraw Hill.
 - Measurement, Instrumentation and Experiment Design in Physics & Engineering, M.Sayer and A. Mansingh, 2005, PHI Learning Pvt. Ltd.
 - Introduction to Measurements & Instrumentation, A.K.Ghosh, 3rd Ed., 2009, PHI Learning Pvt.Ltd.
 - Electronic Devices & circuit Theory, R.L. Boylestad and L.D. Nashelsky, 2009, Pearson India
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PHYSICS PRACTICAL-VIII

(Students have to perform at least 5 experiments from the section VIIIA. Additional experiments may be included with the approval of the committee of courses)

PHYSICS LAB.-VIIIA

1. To design a power supply of given rating using bridge rectifier and study effect of C-filter
2. To design the active Low pass and High pass filters of given specification
3. To design the active filter (wide band pass and band reject) of given specification
4. To study the output and transfer characteristics of a FET
5. To design a common source FET Amplifier and study its frequency response.
6. Determine output characteristics of a LVDT and measure displacement using LVDT
7. Measurement of Strain using Strain Gauge.
8. Measurement of level using capacitive transducer.
9. Study of distance measurement using ultrasonic transducer.
10. Calibrate Semiconductor type temperature sensor (AD590, LM35, or LM75)
11. To measure the change in temperature of ambient using Resistance Temperature Device (RTD)
12. Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source). Study of counting statistics.
13. Study of possible radiation in different materials (eg. KSO_4) using GM at operating voltage.