

MODULE 4. ELECTRONIC FUNDAMENTALS

4.1 Semiconductors

4.1.1 Diodes

(a) Diode symbols;

Diode characteristics and properties;

Diodes in series and parallel;

Main characteristics and use of silicon controlled rectifiers (thyristors), light emitting diode, photo conductive diode, varistor, rectifier diodes;

Functional testing of diodes.

(b) Materials, electron configuration, electrical properties;

P and N type materials: effects of impurities on conduction, majority and minority characters;

PN junction in a semiconductor, development of a potential across a PN junction in unbiased, forward biased and reverse biased conditions;

Diode parameters: peak inverse voltage, maximum forward current, temperature, frequency, leakage current, power dissipation;

Operation and function of diodes in the following circuits: clippers, clampers, full and half wave rectifiers, bridge rectifiers, voltage doublers and triplers;

Detailed operation and characteristics of the following devices: silicon controlled rectifier (thyristor), light emitting diode, Schottky diode, photo conductive diode, varactor diode, varistor, rectifier diodes, Zener diode.

4.1.2 Transistors

(a) Transistor symbols;

Component description and orientation;

Transistor characteristics and properties.

(b) Construction and operation of PNP and NPN transistors;

Base, collector and emitter configurations;

Testing of transistors.

Basic appreciation of other transistor types and their uses.

Application of transistors: classes of amplifier (A, B, C);

Simple circuits including: bias, decoupling, feedback and stabilisation;

Multistage circuit principles: cascades, push-pull, oscillators, multivibrators, flip-flop circuits.

4.1.3 Integrated Circuits

Description and operation of logic circuits and linear circuits;

Introduction to operation and function of an operational amplifier used as: integrator, differentiator, voltage follower, comparator;

Operation and amplifier stages connecting methods: resistive capacitive, inductive (transformer), inductive resistive (IR), direct;

Advantages and disadvantages of positive and negative feedback.

4.2 Printed Circuit Boards

Description and use of printed circuit boards.

4.3 Servomechanisms

Understanding of the following terms: Open and closed loop, follow up, servomechanism, analogue, transducer, null, damping, feedback, deadband;

Construction operation and use of the following synchro system components:

resolvers, differential, control and torque, E and I transformers, inductance

transmitters, capacitance transmitters, synchronous transmitters;

Servomechanism defects, reversal of synchro leads, hunting.