

## MODULE 4 – ELECTRONIC FUNDAMENTALS

| Sl. No.       | Topics to be Covered                                                                                                                                                                                                                | Level |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|               |                                                                                                                                                                                                                                     | B2    |
| <b>4.1.</b>   | <b>SEMICONDUCTORS</b>                                                                                                                                                                                                               |       |
| <b>4.1.1.</b> | <b>DIODES</b>                                                                                                                                                                                                                       |       |
|               | a. Diode symbols, Diode characteristics and properties;                                                                                                                                                                             | 2     |
|               | b. Diodes in series and parallel;                                                                                                                                                                                                   |       |
|               | c. Main characteristics and use of silicon-controlled rectifiers (Thyristor), light emitting diode, photo conductive diode, varistor, rectifier diodes;                                                                             |       |
|               | d. Functional testing of diodes.                                                                                                                                                                                                    |       |
|               | e. Materials, electron configuration, electrical properties;                                                                                                                                                                        |       |
|               | f. P and N type materials: effects of impurities on conduction, majority and minority characters;                                                                                                                                   |       |
|               | g. PN junction in a semiconductor, development of a potential across a PN junction in unbiased, forward biased and reverse biased conditions;                                                                                       |       |
|               | h. Operation and function of diodes in the following circuits: clippers, clampers, full and half wave rectifiers, bridge rectifiers, voltage doublers and triplers;                                                                 |       |
|               | i. Detailed operation and characteristics of the following devices: silicon-controlled rectifier (thyristor), light emitting diode, Shottky diode, photo conductive diode, varactor diode, varistor, rectifier diodes, Zener diode. |       |
| <b>4.1.2.</b> | <b>TRANSISTORS</b>                                                                                                                                                                                                                  |       |
|               | a. Transistor symbols;                                                                                                                                                                                                              | 2     |
|               | b. Component description and orientation;                                                                                                                                                                                           |       |
|               | c. Transistor characteristics and properties.                                                                                                                                                                                       |       |
|               | d. Construction and operation of PNP and NPN transistors;                                                                                                                                                                           |       |
|               | e. Base, collector and emitter configurations;                                                                                                                                                                                      |       |
|               | f. Testing of transistors.                                                                                                                                                                                                          |       |
|               | g. Basic appreciation of other transistor types and their uses.                                                                                                                                                                     |       |
|               | h. Application of transistors: classes of amplifier (A, B, C);                                                                                                                                                                      |       |
|               | i. Simple circuits including: bias, decoupling, feedback and stabilisation;                                                                                                                                                         |       |
|               | j. Multistage circuit principles: cascades, push-pull, oscillators, multi-vibrators, flip-flop circuits.                                                                                                                            |       |
| <b>4.1.3.</b> | <b>INTEGRATED CIRCUITS</b>                                                                                                                                                                                                          |       |
|               | a. Description and operation of logic circuits and linear circuits;                                                                                                                                                                 | 2     |
|               | b. Introduction to operation and function of an operational amplifier used as: integrator, differentiator, voltage follower, comparator;                                                                                            |       |
|               | c. Operation and amplifier stages connecting methods: resistive capacitive, inductive (transformer), inductive resistive (IR), direct;                                                                                              |       |
|               | d. Advantages and disadvantages of positive and negative feedback.                                                                                                                                                                  |       |

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|         |                                                                                                                                                                                                                               | B2    |
| 4.2.    | <b>PRINTED CIRCUIT BOARDS</b>                                                                                                                                                                                                 |       |
|         | a. Description and use of printed circuit boards.                                                                                                                                                                             | 2     |
| 4.3.    | <b>SERVOMECHANISM</b>                                                                                                                                                                                                         |       |
|         | a. Understanding of the following terms: Open and closed loop, follow up, servomechanism, analogue, transducer, null, damping, feedback, dead band;                                                                           | 2     |
|         | b. 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; |       |
|         | c. Servomechanism defects, reversal of synchro leads, hunting.                                                                                                                                                                |       |