

NE03: Jr. Engineer (S&T)

BASIC ELECTRICAL ENGINEERING

Basic concepts and principles of D.C and A.C fundamental, A C circuits, batteries, electromagnetic induction etc. including constant voltage and current sources.

ANALOG ELECTRONICS

Fundamental concepts of basic electronics and basic understanding of conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers in electronics, understanding of filters in rectifiers, tunnel diodes, LEDs, varactor diodes, LCD; working of transistors in various configurations; Concept of FETs and MOSFET etc.

CONTROL SYSTEMS

Basic elements of control system, open loop control system, closed loop control system, control system terminology, manually controlled closed loop systems, automatic controlled closed loop systems, basic elements of a servo mechanism, Examples of automatic control systems, use of equivalent systems for system analysis, linear systems, non-linear systems, control system examples from chemical systems, mechanical systems, electrical systems, introduction to Laplace transform.

Transfer function analysis of ac and dc servomotors synchros, stepper motor, amply dyne. ac position control system, magnetic amplifier.

Control system representation: Transfer function, block diagram, reduction of block diagram, problems on block diagram, Mason's formula signal flow graph

Time Response Analysis : Standard test signals, time response of first and second-order system, time constant, time response of second order system, time response specifications, steady-state errors and error constants, problems in first and second order system.

Stability: Routh Hurwitz Criterion, Root Locus, Bode Plotting using semi log graph paper

Introduction to multiloop control system and its types, feedforward, cascade, ratio, split range, control system. Study of different processes using above mentioned control systems

Non-Linear Control System : Introduction, behaviour of non-linear control system. Different types of nonlinearities, saturation, backlash, hysteresis, dead zone, relay, friction, characteristics of non-linear control system, limit cycles, jump resonance, jump phenomenon. Difference between linear and non-linear control system.

ELECTRONIC COMPONENTS AND MATERIALS

Materials :

Classification of materials , Conducting, semi-conducting and insulating materials through a brief reference to their atomic structure.

Conducting Materials : Resistors and factors affecting resistivity such as temperature, alloying and mechanical stressing. Classification of conducting materials into low resistivity and high resistivity materials.

Insulating Materials : Important relevant characteristics (electrical, mechanical and thermal) and applications of the following material: Mica, Glass, Copper, Silver, PVC, Silicon, Rubber, Bakelite, Cotton, Ceramic, Polyester, Polythene and Varnish.

Magnetic Materials : Different Magnetic materials; (Dia, Para, Ferro) and their properties. Ferro magnetism, Domains, permeability, Hysteresis loop. Soft and hard magnetic materials, their examples and typical applications.

MEASURING INSTRUMENTS

Introduction to Testing and Measurements, Measurement of Resistance, Inductance and Capacitance, Ammeter, Voltmeter and Multimeter, Power and Energy Measurements, Frequency and Phase difference Measurement

PRINCIPLES OF INSTRUMENTATION

Basic building blocks of any instrumentation systems, Performance characteristics of Oscillator Instruments, Instrument selection: Factors affecting instrument selection, accuracy, precision, linearity, resolution, sensitivity, hysteresis, reliability, serviceability, loading effect, range advantage and limitation, cost effectiveness and availability
- Static and dynamic response - Environmental effects - Calibration tools

FUNDAMENTALS OF DIGITAL ELECTRONICS

Concepts of Digital electronics, Number system , gates, codes, arithmetic logic circuits, flip-flops, shift registers and counters.

BASIC OF Microprocessors

Architecture of a typical microprocessor, configurations and instructional pair configuration systems and working of various peripheral interface chips. 8085 Microprocessors, architecture, instruction sets and introduction to 8086.

POWER ELECTRONICS

Introduction to thyristors and other power Electronics devices, Controlled Converters, Inverters, Choppers.

COMPUTER AIDED INSTRUMENTATION

Computer aided Instrumentation, Buses and Standards : Introduction , BUS types : The I/O BUS a) ISA bus b) EISA Bus c) PCI bus , GPIB 2.5 RS-232, Linear Circuits and Signal Conditioning, Parallel Port (PP) Interfacing Techniques, Serial Port (SP) Interfacing Techniques, USB Port Interfacing Techniques.

QUALITY AND RELIABILITY TECHNIQUES

Quality organization and Management: Introduction, Quality Policy, Task for Quality and Introduction to Total Quality Systems

Quality costs : Prevention costs, appraisal costs, internal failure costs, external failure costs, impact of quality costs on profitability