

EE 404: ELECRO-TECHNOLOGY-II (ME & CHE)

(3 – 1 – 2)

Theory Marks:100

Sessional Marks: 50

Laboratory Marks : 50

Time = 3 hours

1. **Analog Electronics:**

Bi-polar transistor (BJT) – PNP and NPN types. Construction and working principle. Identifying the leads of the transistor. Transistor as an amplifier. Transistor configurations – CB, CE and CC. Characteristic of CE configuration. α and β factors and their relation. Biasing of transistor.. Operating point. Load line analysis. Performance of the transistor amplifier – input and output resistance, effective collector load, voltage gain and power gain. Graphical representation of working of the single stage amplifier. Field Effect Transistor (FET) – construction and working principle. Difference between BJT and FET.

2. **Digital Electronics:**

Digital signals. Basic building blocks in digital electronics – NOT, AND and OR gates. The NAND, NOR and EX-OR gates. Boolean algebra, DeMorgan's theorems. Number system and codes – the decimal, the binary, octal and hexadecimal number systems: conversion from one another.

Combinational logic design : - standard representation of logical functional in SOP and POS forms. Logic design in SOP form – truth table to logic equation to realization using gates. Reduction of logic equations. Introduction to half adder, full adder, BCD to 7 segments display decoder. ADC, DAC(to be treated as black boxes)

3. **Introduction to feed back control systems:** -
(For Mechanical Engineering students only)

Open-loop and closed-loop systems; examples of control systems; definition of linear, non-linear, time-variant, time-invariant, continuous and discrete control systems; characteristics of closed-loop (feedback) control systems, positive and negative feedback systems; transfer function-concept and properties, poles, zeros, pole-zero map and characteristic equation.

Formulation of differential equations for dynamic systems; transfer functions of linear systems; construction of block diagram of control systems, determination of transfer function using block diagram reduction technique.

Time response of control systems- the unit step, unit ramp and unit acceleration test inputs, First and second order systems. Transient response of under-damped second order systems, Steady state errors.

Introduction to stability analysis of feedback control systems; Routh-Hurwitz's stability criterion.

Frequency response analysis of second order systems, relation between time response and frequency response, Bode plot.

4. **Transducers** –

(For Chemical Engineering students only)

Definition, classification, Mechanical and electrical transducers, Primary and secondary transducers, active and passive transducers. Basic requirements of transducers.

Temperature transducers–thermistor, thermocouple, characteristics of thermocouple transducers, Resistance-Temperature detector (RTD); Solid state sensor – transistor used as a temperature sensor.

Pressure transducers- elastic element used as pressure sensors – membranes, thin plates corrugated diaphragms, capsules, bellows, Bourdon tube. Transducers types – LVDT type, variable capacitance type, strain gauge type, piezo electric pressure transducer.

Displacement transducers –LVDT and resistive potentiometric transducers for translational and rotational displacement measurement, Digital transducers.

Flow transducers – restriction flow transducers, obstruction flow transducers, and magnetic transducers.

5. Electric Heating and Welding:

Electric Heating and heating methods, Advantage of electric heating.

Resistance heating –direct and indirect type. Heating elements. Temperature control.

Electric arc furnace – direct type, indirect type

Induction Heating – principle and applications; induction furnace – different types.

Dielectric Heating – principle and applications.

Electric welding and classification. Resistance welding and arc welding, dc generator for arc welding, welding transformer

Books:

- 1) Ogata, K.: Modern Control Engineering (PHI).
- 2) Shawanay, A. K.: Electrical Measurements and Measuring Instruments (Dhanpat Rai)
- 3) Jain, R. P.: Digital Electronics
- 4) Mehta, V. K.: Principles of Electronics (S. Chand & Co.).
- 5) Partab, H.: Art and Science of Utilization of Electrical Energy

Reference book:

- 1) Mandal, Soumitra K.: Digital Electronics
- 6) Elgerd, E.: Utilization of electrical energy
- 7) B.S.Manke: Control system Engineering