EX- 604 – Electronic Instrumentation

Unit-I

Electronic Voltmeter: Electronic voltmeter and their advantages, VTVMs Differential amplifier type electronic voltmeter, D.C. voltmeter using direct coupled amplifier, chopper amplifier type of voltmeter, Electronic voltmeters using rectifiers, True RMS responding voltmeter, Electronic multimeters, Differential voltmeter, Vector voltmeter, Vector impedance meter, measurement of power at radio frequency, calorimeter, Bolometer

CRO: Different parts of CRO, Its Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Screen for CRTs, Graticule, Vertical & Horizontal deflection system, Time base circuit, Oscilloscope probes and transducers, Attenuators, Application of CROs, Lissajous patterns, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog & Digital) Oscilloscopes.

Unit-II

A.C. Bridge Measurement: Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwells inductance capacitance bridge, Hays bridge, Andersons bridge, Owen's Bridge, De-sauty's Bridge, Schering Bridge, High Voltage Schering bridge, Measurement of relative permittivity, Heaviside cambell's bridge, Weins bridge, Universal bridge, Sources of errors in Bridge circuit, Wagner's Earthing device, Q meter and its applications and measurement methods.

Transducers: Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Resistive inductive and capacitive transducers, strain gauge and gauge factor, Thermistor, Thermo couples, LVDT, RVDT, Synchros, Piezo-Electric transducers, Magnet elastic and magnetostrictive Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, photo diode and photo conductive cells, Photo transistors, Photo optic transducers.

Unit-III

Signal Generators:Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator, TV Sweep generator, Marker generator, Sweep-Marker generator, Wobblyscope, Video pattern generator Vectroscope, Beat frequency oscillator

Wave analyser:Basic wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion, analyzer, spectrum analyzer digital Fourier analyzer.

Unit-IV

Digital Instruments Advantages of Digital instruments over analog instruments, resolution and sensitivity of Digital meters. Digital Voltmeter - Ramp type, Dual slope integration type, Integrating type, Successive approximation type, Continuous balance DVM or Servo balancing potentiometer type □VM. Digital Multimeter, Digital frequency meter, Time period measurement, High frequency measurement, Electronic counter, Digital tachometer, Digital PH meter, Digital phase meter, Digital capacitance meter. Digital display system and indicators like CRT, LED, LCD, Nixies, Electro luminescent, Incandescent, Electrophoretic image display, Liquid vapour display dot-matrix display Analog recorders, Graphic recorders, Strip chart recorders, Galvanometer type recorders, Null recorders, single point & multipoint recorders, X-Y records, Ultraviolet recorders, Magnetic tape recorders, Basic components of tape recorders, Methods of recording, Direct recording, Frequency modulated recording, Pulse duration modulation recording, Digital tape recorders.

Unit-V

Instruments used in computer-controlled instrumentation RS 232C and IEEE 488, GPIB electric interface. Introduction to analog & Digital data acquisition systems-Instrumentation systems used, Interfacing transducers to electronic control & measuring systems Multiplexing - D/A multiplexing A-D Multiplexing, Special encoders. Digital control description Microwave instruments, Scattering parameters, Transmission and reflection parameters, Network analyzer, Measurement uncertainty measurement with scalar & vector network, Network analyzers, Microwave power measurement-Sources & detectors, Fiber optic power measurement, Stabilized calibrated light sources end to end measurement of fiber losses, Optical time domain reflectometry.

References:

 Albert. D. Helfrick, W.D. Cooper, "Modern Electronic Instrumentation and measurement techniques", PHI.

 Kalsi H.S., "Electronic Instrumentation", TMH.

 Ghosh, Introduction to Measurement & Instrumentation, forth Edition. PHI.

 Morris A.S., "Principles of Measurement & Instrumentation".

 Rangan C.S., G.R. Sarma, Mani, "Instrumentation : Devices & systems", TMH

 Murthy BVS, "Transducers and Instrumentation", PHI.

 Doeblin D.O., "Measurement Systems- Applications and Design".

List of Experiments:

1. Measurement of inductance of a coil using Anderson Bridge.
2. Measurement of capacitance of a capacitor using schering bridge.
3. LVDT and capacitance transducers characteristics and calibration.
4. Resistance strain gauge- Strain Measurement and calibration.
5. Measurement of R,L,C & Q using LCR-Q meter.
6. Study & measurement of frequency using Lissajous patterns.
7. Measurement of pressure using pressure sensor.
8. Study of Piezo-electric Transducer and Measurement of impact using Piezo-electric Transducer
9. Measurement of Displacement using LVDT.
10. Measurement of speed of a Motor using photoelectric transducer.
11. Study & Measurement using ph meter.
12. Temperature measurement & Control using thermo couple & using thermistor.