

# Vidyalankar

S.E. Sem. IV [ETRX]

Electronic and Electrical Measuring Instruments and Machine

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## SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks

Term Work : 25 Marks

Oral : 25 Marks

### 1. Electronic and Digital Voltmeters :

Principles of operation, advantages over conventional type analog voltmeters, basic voltmeter, peak reading, average reading true RMS reading, sampling type, FET voltmeters, sensitivity considerations & calculations.

Methods of analog-to-digital and digital-to-analog conversion, principles of operation and typical specifications of a digital voltmeter, description of various types of DVMs with block diagrams, Resolution and Sensitivity of a digital meter, digital displays for meters.

### 2. Frequency meters, phase meters and signal generators ;

Analog-schematic & operational details, limitations. Digital Frequency meters, Phase measurement by voltage addition method, balanced modulation type, phase meters using flip-flops, digital meters, advantages & limitations of each type. Requirement of a good laboratory type signal generator, A.F. signal generators, Beat frequency oscillator & its advantages.

### 3. Oscilloscopes :

Block diagram study of C.R.O., Description of panel layout & implementation of controls. Requirement of time base, triggered time base, delayed time base, external triggering etc. Lissajous patterns, use of these in phase & frequency measurements. Frequency time base, Wobbler scope & its applications, Dual trace, multi trace, Double beam, Sampling; Storage, Digital read-out oscilloscopes. Use of CRO in square wave testing of amplifiers, tracing of diode & transistor characteristics.

### 4. Basic measuring instruments :

Essentials of indicating instruments – deflecting, controlling and damping torque. Construction and working principles of moving iron and moving coil ammeters and voltmeters, electro-dynamometer watt-meters, induction type energy meters, power factor meters, instrument transformers.

### 5. Measurement of R, L and C :

Measurement of low, medium, high resistances: Ohmmeter, Kelvin's double bridge, Wheatstone's bridge, Megger. Measurement of inductance: Maxwell's, Hay's and Anderson's bridge. Measurement of capacitance: Schering bridge.

### 6. 6.1. DC Motors :

Back e.m.f., voltage equation, characteristics of series, shunt and compound motors, torque equations, speed control of dc shunt/series motors, three point and four point starter and applications of dc motors.

### 6.2. Three phase induction motors :

Construction and principle of operation, slip, rotor frequency, torque equation, torque-speed characteristics, starting methods of induction motors.

### 6.3. Stepper motors :

Construction, working principle and applications of variable reluctance, permanent magnet and hybrid stepper motors.

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**References :**

1. Electronics Instrumentation & Measurement Techniques, third edition (*Cooper W.D. & Helfrick A.D.*) Prentice Hall of India, 1985.
2. Electronic Instrumentation, first edition, (*Kalsi H.S.*) Tata McGraw Hill, 1997.
3. Electrical and electronic measuring instruments (*A.K. Sawhney*)
4. Electrical Measurements and measuring instruments, (*Golding and Widdis*)
5. Electric Machines, (*Nagrath and Kothari*)

