UNIT I

Chapter 1 : Introduction to Measurement 1-1 to 1-22

Syllabus :

1.1 Types of measurement, Classification of instruments, Static terms and characteristics- Range and Span, Accuracy and Precision, Reliability, Calibration, Hysteresis and Dead zone, Drift, Sensitivity, Threshold and Resolution, Repeatability and Reproducibility, Linearity. Dynamic characteristics : Speed of response, Fidelity and Dynamic errors, Overshoot.

1.2 Measurement of error : Classification of errors, environmental errors, signal transmission errors, observation errors, operational errors.

1.3 Classification of transducers, active and passive, Contact non contact, Mechanical electrical analog digital.

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1.1.1 Significance of Measurement 1-2

1.1.2 Applications of Measurement 1-2

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1.1.8 Undesirable Characteristics 1-15

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1.3 Transducers 1-18

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UNIT II

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2.2 **Force Measurement System** - characteristic of force measurement, creep curve for force transducer.

2.3 **Force and Load Sensors** - Types of load cell, load cell applications, construction and working of quartz force sensor, force rings.

2.4 **Torque Measurement** - Inline and Reaction torque measurement.

2.5 **Torque sensors** - Construction and working of slip ring, rotary transformer, infrared sensor, FM transmitter.

2.6 **Dynamometers** - Construction and working of transmission dynamometer, absorption dynamometer, eddy current dynamometer.

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2.5.4 FM transmitter 2-17

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2.6 Dynamometers 2-17

✓ **Syllabus Topic :** Construction and Working of Eddy Current Dynamometer 2-17

2.6.1 Eddy Current Dynamometer 2-17

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2.6.2 Strain Gauge Transmission Dynamometer 2-18

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Chapter 3 : Pressure and Temperature Measurement **3-1 to 3-34**

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3.1 Pressure Measurement - Low pressure gauges - McLeod Gauge, Thermal conductivity gauge, Ioniation gauge, Thermocouple vacuum gauge, Pirani gauge, High pressure gauge – Diaphragm, Bellows, Bourdon tube, Electrical resistance type, Photoelectric pressure transducers, piezoelectric type

3.2 Non-electrical methods - Bimetal, Liquid in glass thermometer and Pressure thermometer

3.3 Electrical methods - RTD, Platinum resistance thermometer, Thermistor, Thermoelectric methods –Elements of thermocouple - Seebeck series, law of intermediate temperature, law of intermediate metals, thermo emf measurement.

3.4 Pyrometers - Working and principle of Radiation and Optical pyrometer.

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Chapter 4 : Flow Measurements 4-1 to 4-15

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4.1 Types of flow meter, Selection criteria for flow meter, classification.

4.2 **Flow meter** - Application and construction of orifice, venturi tube, segmental wedges, pitot tube, Dall tube.

4.3 **Variable area meter** - construction, working and principle of Rotameter, anemometer.

4.4 **Positive displacement flow meter** - construction, advantages and disadvantages of coriolis flow meter, Oscillating piston flow meter, Rotating vane flow meter.

4.5 **Ultrasonic flow meter** - Application and construction of Doppler and transit time ultrasonic flow meter.

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4.5.1 Transit Time Ultrasonic flow Meter 4-14

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UNIT V

Chapter 5 : Vibration and Strain Measurement 5-1 to 5-17

Syllabus :

5.1 Concept of natural frequency, free body diagram and spring mass system.

5.2 Vibration measurement element - principle and working of velocity pickup, Accelerometer, Inductive Pick Up, Capacitive Pick Up , Stroboscope.

5.3 Introduction to FFT Analyzer, working and application.

5.4 Types of Strain gauges - bonded and unbounded, gauge factor, strain gauge selection criteria.

5.5 Methods of strain measurement - Axial, bending, torsional.

5.6 Construction of foil, semiconductor and wire wound strain gauge.

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UNIT VI

Chapter 6 : Miscellaneous Measurement Sound, Speed and Humidity Measurements 6-1 to 6-18

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6.1 Sound measurement, Principle of Electro dynamic microphone and Carbon microphone.

6.2 **Speed measurement :** Working and principle of Eddy current generation type tachometer, incremental and absolute type, Mechanical Tachometers, Revolution counter & timer, Slipping Clutch Tachometer, Electrical Tachometers, Contact less Electrical tachometer,

6.3 **Humidity measurement :** working and principle of Hair hygrometer , sling psychomotor..

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