D 036

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2003.

Third Semester

Textile Technology

EE 251 — BASIC INSTRUMENTATION

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Classify the instruments by at least four different criteria.

2. What is meant by calibration of an instrument? What is the necessity of periodical recalibration of instruments?

3. What is a Fotonic sensor? Name its application.

4. Name at least four types of digital shaft encoders.

5. Define 'slew rate' and 'full power frequency response' of an operational amplifier.

6. Draw the block diagram of a generalized data acquisition system.

7. Draw the circuit of a basic first order high pass filter and express its transfer function.

8. State any two laws of thermocouple.

9. Define absolute and kinematic viscosity.

10. A pipe carrying a fluid vibrates at a frequency of 50 Hz with displacement of 8 mm from the equilibrium position. Calculate the peak acceleration.

PART B — (5 × 16 = 80 marks)

11. (i) Explain in detail the three type of systematic errors and discuss the methods of reducing them in measurement. (12)

(ii) A voltmeter having a sensitivity of 1000 Ω/V reads 100 V in its 150 V scale when connected across an unknown resistor in series with a milli ammeter. When the milli ammeter reads 5mA, calculate : (4)

(1) apparent value of unknown resistor

(2) actual value of unknown resistor

(3) error due to loading effect of voltmeter.

12. (a) (i) What is a strain gage? Discuss the different types of strain gages. Also derive an expression for gage factor of a strain gage. (10)

(ii) Explain the basic structure, principle of operation and applications of a LVDT. (6)

Or

(b) With relevant diagrams explain the structure and operation of the following :

(i) Turbine type flow meter. (8)

(ii) Reference and measuring electrodes for pH measurement. (8)

13. (a) (i) Discuss in detail the level measurement using capacitive transducer and ultrasonic transducer. Draw the relevant diagrams. (10)

(ii) Discuss briefly the dynamic response of elastic transducers. (6)

Or

(b) (i) With suitable circuit show how linear gain control can be achieved in an instrumentation amplifier. (10)

(ii) Design a differentiator for operating in the range of 20 Hz to 20 kHz with phase error not exceeding 5° and with an effective damping coefficient more than 1.0. (6)

14. (a) (i) Discuss in detail any four type of pressure measuring instrument. (10)

(ii) Explain the working principle of a liquid filled pressure thermometer with compensation. Draw the relevant diagram. (6)

Or

(b) Discuss in detail the different industrial moisture measurement techniques. (16)

15. (a) Discuss in detail the following techniques of analog to digital conversion with suitable diagrams.

(i) Successive approximation method. (8)

(ii) Single slope integration technique. (8)

Or

(b) (i) Explain with diagram the basic structure and functioning of a cathode ray tube. (10)

(ii) Write short note on LCD. (6)
