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B.E. / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2011

ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH

FIFTH SEMESTER

EC 9306 – MEASUREMENTS AND INSTRUMENTATION

(REGULATIONS 2008)

Time: 3 Hours Max. Marks:100

Answer All Questions

PART-A **(10 x 2 = 20 Marks)**

1) What is meant by calibration?
2) Calculate the maximum percentage error in the difference of two measured voltages, when $V_1 = 200V \pm 4\%$ and $V_2 = 120V \pm 8\%$
3) Write short notes about the IC sensors.
4) What is the use of thermistor?
5) Differentiate the logic analyzer compared with spectrum analyzer.
6) List out the merits of signal conditioning circuits in digital instruments.
7) Define the term automation in Voltmeter.
8) How do you measure the Millimeter waves?
9) Why synchronization is required in CRO?
10) State any four applications of measurement systems in Nanotechnology.

PART – B **(5 x 16 = 80 Marks)**

11. (a)

(i) Ten measurement's of a metal film resistor readings are 101.1, 101.2, 101.3, 101, 101.4, 101.5, 101.2, 101.0, 101.3, 101.0. Calculate the following, assuming the standard errors are present. (8)

(i) Mean (ii) standard deviation (iii) probability error

(ii) Define and explain the following:

(a) Instrument errors (4)

(b) Limiting errors and Environmental errors (4)

12.

(a) (i) Explain the construction, principle and working of a linear voltage differential transformer (LVDT). (6)

(ii) An LVDT has an output of 6V rms when the displacement is 0.4×10^{-3} mm. Determine the sensitivity of this instrument in V / mm. A 10 V voltmeter with 100 scale divisions is used to read the output. Two tenths of a division can be estimated with ease. Determine the resolution of the voltmeter.

The above arrangement is used in a pressure transducer for measuring the deflection of a diaphragm. The diaphragm is deflected through 0.5×10^{-3} mm by a pressure of 1000 N / m^2. Determine the sensitivity and resolution of this instrument. (10)

(or)

(b) (i) Explain the construction of capacitive strain gauges and derive the expression for the gauge factor. (8)

(ii) The following table gives the variation of resistance with temperature for a RTD. (8)

Temperature °C	15	18	21	24	26.5	29.5	33
Resistance Ω	106.06	167.14	108.22	109.3	110.38	111.46	112.75

Find the linear and quadratic approximation of the above resistance temperature curve for temperature variations between 15°C and 33°C about a mean temperature of 24°C.

13.

(a) (i) The four arms of a bridge are:

Arm ab : an imperfect capacitor C_1 with an equivalent series resistance of r_1

Arm bc : a non inductive resistance R_3

Arm cd : a non inductive resistance R_4

Arm da : an imperfect capacitor C_2 with an equivalent series resistance of r_2 in series with a resistance R_2.

A supply of 450 Hz is given between terminal a and c and the detector is connected between b and d. At balance R_2 = 4.8 Ω, R_3 = 200 Ω, C_2 = 0.5 μF, r_2 = 0.4 Ω. Calculate the value of C_1 and r_1 and also of the dissipating factor of this capacitor. (16)

(or)

(b)Explain briefly with neat diagram, the working of the following:

(i) Data acquisition system (8)

(ii) Wave Analyzer (8)

14.

(a)

(i) Discuss in detail about the accuracy and resolution in DVM. (8)

(ii) Discuss briefly the working of IEEE 488 bus. (8)

(or)

(b) Explain in detail about the following items with neat diagram.

(i) Frequency Counter (8)

(ii) Data Logger (8)

15.

(a) Give the detail comparison table for the following items:

(i) Digital storage oscilloscope vs. Analog storage oscilloscope (8)

(ii) Digital recorders and printers vs. Analog recorders and printers (8)

(or)

(b) Explain the architecture of Virtual Instrumentation and mention its applications in various fields. (16)