Total number of printed pages–4

53 (IE 302) FDIN

2021

FUNDAMENTALS OF INSTRUMENTATION

Paper : IE 302

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* What is settling time? 2

   (b) How to prove a system is causal? 4

   (c) What are the human errors? 6

   (d) In a certain manufacturing process, the length of shafts produced has a mean length of 300 *cm* and a standard deviation of 2 *cm*. If the shaft diameter range from 296 to 304 *cm* is acceptable, how many rejections would you expect in a random list of 10 lakhs shifts? 8

Contd.

2. *(a)* What is the significant of active power? 2

(b) Define Precision and Drift. 4

(c) Write a note on standards. 6

(d) Draw the block diagram of weight measurement system. 8

3. *(a)* What is input impedance of non-investing amplifier? 2

(b) Draw inverting amplifier and equation. 4

(c) Explain op-amp based V to I converter. 6

(d) Write a note on Fundamental SI Units. 8

4. *(a)* Why is 4 to 20 *mA* used in current transmission? 2

(b) What is the use of unity gain amplifier? 4

(c) What are the calibration methods? 6

(d) Write Gaussian distribution equation. Find out mean, mode, variance of 21, 22, 20, 25, 20, 21, 22, 23, 24, 20, 25, 21, 20, 23, 24, 25, 20, 21, 24, 23 8

5. (a) How voltmeter is calibrated? 2

(b) What are the features of Ideal op-amp? 4

(c) Draw the Differential amplifier. 6

(d) If $R_1 = \frac{R_2 \cdot R_3}{R_4}$, $R_2 = 100\Omega \pm 1\%$, $R_3 = 200\Omega \pm 2\%$, $R_4 = 150\Omega \pm 2\%$ calculate the limiting resistance of R_1. 8

6. (a) Compare null-type and deflection-type. 2

(b) A $2A$ ammeter has an internal resistance of 10Ω. For extending its range to measure $5A$, find the shunt resistance. 4

(c) Define the following : 6

(i) Fidality

(ii) Black lace

(iii) Non-linearity.

(d) Write short note on Method of least squares. 8