Total number of printed pages: 02 **D/3/DIE303**

2022

FUNDAMENTALS OF INSTRUMENTATION

Full Marks: 100

Time: Three hours

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

Part-A: Answer all questions

1. a) Measurand is given to the ..... element of the measurement system.

b) …… is the maximum deviation of measured value of an instrument from its true value.

c) ……element of the measurement system does the amplification of the quantity.

d) International standards are defined by ..... agreement.

e) Environmental error is a type of ..... error.

f) …… of an instrument is the maximum change of the output.

g) ..... is the instrument sensitivity if its input-output relation is given as: $\mathbf{4X_o = 2X_i}$

h) Static characteristic of the instrument is obtained when the input variable is ……

i) ……. of an instrument is the smallest input for which an output is obtained.

j) The causes of ..... errors in the measurement are not exactly known.

k) A strip chart recorder is used to record one or more variable with respect to .....

l) ……. error arise due to the misuse of instrument.

m) …….. standards are kept in the National Standards Laboratories in different countries.

n) …… numbers of 7-segment are required to display a two digit number.

o) ..... errors arise mainly due to human mistakes such as; reading the instrument value, recording and calculating the measured value.

p) …… of an instrument is the range of different input values over which there is no change in output value.

q) ……. recorder is used to record V-I characteristics of diode.

r) ……. characteristics of an instrument is obtained when the input variable is changing rapidly with time.

s) ……..... numbers of LED are in a 7-segment display.

t) …….. of an instrument is the closeness of output readings for the same input when there are changes in the method of measurement, observer, measuring instrument location, conditions of use and time of measurement. 1*20=20

Part-B: Answer any four questions

2.	a)	With a neat block diagram, explain the measurement system.	8
	b)	Write the classification of instrument. Explain any four classification of it.	12
3.	a)	Write in detail about the characteristics of an instrument.	10
	b)	Derive input-output relation for the second order instrument and also draw its dynamic response.	10
4.	a)	Write the classification of recorder. With a neat diagram, explain strip chart recorder.	10
	b)	Specify the types of error. Explain systematic error and its types.	10
5.	a)	The current passing through a resistor; (100 ± 0.2) Ω is (2 ± 0.01) A. Determine the limiting error of the power dissipated in the resistor.	8
	b)	The wavelength (nm) of a radiation was recorded as: 381, 380, 382, 389, 383 by five different students while performing the lab experiment. Calculate the arithmetic mean, average deviation, standard deviation and variance of the recorded wavelength.	12
6.	a)	Three resistors; R_1= 37Ω ± 5%, R_2= 75Ω ± 5% and R_3 = 50Ω ± 5% are connected in series. Calculate the equivalent resistance magnitude and limiting error in ohms.	8
	b)	With the help of diagram, explain any two methods for measuring the following:	
	(i)	Temperature	6
	(ii)	Displacement	6

……