



BRAINWARE UNIVERSITY

Term End Examination 2023-2024

Programme – M.Tech.(RA)-2023

Course Name – Measurement and Sensor for Robotics

Course Code - PCC-MIRA201

(Semester II)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Using a voltmeter measured value is 24.3V, while its true value is 24V. The relative error of measurement is
- | | |
|-----------------|----------------|
| a) 1.25 percent | b) 1.2 percent |
| c) 1.3 | d) 1.4 |
- (ii) Which of the following error is caused by a reversal of measured property?
- | | |
|-----------------------|-----------------------|
| a) Hysteresis | b) Noise |
| c) Digitization error | d) Quantization error |
- (iii) Which of the following is not an analog sensor?
- | | |
|-------------------|----------------------------|
| a) Potentiometer | b) Force-sensing resistors |
| c) Accelerometers | d) None of the mentioned |
- (iv) Identify Thermocouple generate output voltage according to _____
- | | |
|-----------------------|-------------|
| a) Circuit parameters | b) Humidity |
| c) Temperature | d) Voltage |
- (v) In a measuring system quantity under measurement is expressed as _____
- | | |
|--------------|----------------|
| a) Measurand | b) Controllers |
| c) Sensors | d) Indicators |
- (vi) In a measurement, the closeness of two or more measurements is illustrated as
- | | |
|--------------|--------------|
| a) Precision | b) Accuracy |
| c) Fidelity | d) Threshold |
- (vii) During a measurement, for a measure value "B", absolute error is obtained as "A", the relative error of measurement is
- | | |
|--------|--------|
| a) A/B | b) B/A |
|--------|--------|

c) $(A+1)/B$

d) $(B+A)/A$

(viii) Relation between scale factor and sensitivity of a transducer is

a) Scale factor is double of sensitivity

b) Scale factor is inverse of sensitivity

c) Sensitivity is inverse of scale factor

d) Sensitivity is equal to scale factor

(ix) The sensitivity of a voltmeter for 0 to 50mA meter movement is illustrated as

a) 20ohm/V

b) 25ohm/V

c) 50ohm/V

d) 5ohm/V

(x) Identify material that is used in photo conductive cell

a) Selenium

b) Quartz

c) Rochelle salt

d) Lithium sulphate

(xi) Identify the ratio of amplitudes of largest (maximum) signal to smallest (minimum) signal to which the system is subjected

a) Time constant

b) Settling period

c) Dynamic range

d) Bandwidth

(xii) Identify the conversion that is correct for load cell

a) Force to strain

b) Force to displacement

c) Force to voltage

d) Both force to strain and force to displacement

(xiii) Determine the following cannot be used for density measurement

a) Hydrometer system

b) Pitot-static device

c) Air bubbler system

d) U-tube system

(xiv) Choose the following device doesn't use storage of liquid

a) Manometer system

b) Hydrometer system

c) U-tube system

d) Air bubbler system

(xv) Determine the following is used to represent mass per unit volume of a substance

a) Mass density

b) Weight density

c) Specific density

d) None of the mentioned

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Explain the applications of measurements.

(3)

3. List the advantages of electrical transducers.

(3)

4. Explain the specifications of transducers.

(3)

5. Define repeatability and reproducibility.

(3)

6. Illustrate the construction of wire wound strain gauges.

(3)

OR

Differentiate between accuracy and precision.

(3)

Group-C
(Long Answer Type Questions)

5 x 6=30

7. Explain the types of Smart sensors used in Robotics. (5)

8. Explain the lead compensation technique with proper diagram. (5)
9. Explain the application of MEMS in robotics. (5)

10. Explain the static characteristics of transducers. (5)

11. Explain how capacitive transducer can be used to measure the level of non-conducting liquid. (5)

12. Explain working principle of Nuclear Thermometer. (5)

OR

Explain the applications of Nuclear thermometer. (5)
