



# BRAINWARE UNIVERSITY

Term End Examination 2023

Programme – M.Tech.-RA-2022

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) Which of the following error is caused by a reversal of measured property?
- |                       |                       |
|-----------------------|-----------------------|
| a) Hysterisis         | b) Noise              |
| c) Digitization error | d) Quantization error |
- (ii) The point is not a characteristic of an ideal transducer
- |                       |                  |
|-----------------------|------------------|
| a) High dynamic range | b) Low linearity |
| c) High repeatability | d) Low noise     |
- (iii) An analog transducer is
- |                        |                   |
|------------------------|-------------------|
| a) Encoders            | b) Strain gauge   |
| c) Digital tachometers | d) Limit switches |
- (iv) Science of precise and accurate measurement of various physical quantities is expressed as \_\_\_\_\_
- |              |                |
|--------------|----------------|
| a) Metrology | b) Meteorology |
| c) Pedology  | d) Mineralogy  |
- (v) In a measurement, the closeness of two or more measurements is illustrated as
- |              |              |
|--------------|--------------|
| a) Precision | b) Accuracy  |
| c) Fidelity  | d) Threshold |
- (vi) 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 |
- (vii) Which of the following can be measured using a Ring-type load cell?
- |                 |                 |
|-----------------|-----------------|
| a) Large weight | b) Small weight |
|-----------------|-----------------|

- c) Both large and small weights  
d) None of the mentioned
- (viii) In a Wheatstone bridge, identify the following that is used as a null detector  
a) Ammeter  
b) Galvanometer  
c) Voltmeter  
d) Wattmeter
- (ix) Which of the following is correct for flapper nozzle system?  
a) Used in hydraulic system only  
b) Used in pneumatic system only  
c) Used in both hydraulic and pneumatic system  
d) None of the mentioned
- (x) Determine the relation that will happen to resistance, if the length of the conductor is increased  
a) Decreases  
b) No change  
c) Increases  
d) Doubles
- (xi) Determine resistivity of metal and semiconductor if the temperature is increased  
a) Increases  
b) Decreases  
c) For metal increases and for semiconductor decreases  
d) For metal decreases and for semiconductor increases
- (xii) Specific volume of all substances depends on \_\_\_\_\_  
a) Temperature only  
b) Pressure only  
c) Both temperature and pressure  
d) Temperature and pressure for some
- (xiii) 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
- (xiv) Identify the correct statement correct for moisture transducers is  
a) Dielectric constant of pure water greater than other materials  
b) Dielectric constant of pure water much less than other materials  
c) Dielectric constant of pure water and of other materials are equal  
d) None of the mentioned
- (xv) Identify the quantities cannot be measured by capacitive transducers  
a) Displacement  
b) Speed  
c) Moisture  
d) None of the mentioned

### Group-B

(Short Answer Type Questions)

3 x 5=15

2. Express the term gauge factor. List any four materials used in Strain gauge with their types. (3)
3. Briefly explain the principles of sensors. (3)
4. Illustrate the requirements of a diaphragm. (3)
5. Express the limitations of Inductive transducer. (3)
6. Differentiate between Primary and Secondary transducers. (3)

OR

Differentiate between Transducers and Inverse Transducers. (3)

### Group-C

(Long Answer Type Questions)

5 x 6=30

7. Describe the operation of the disappearing filament type total radiation pyrometer. (5)
8. Derive the expression for the error of a resistance potentiometer when connected to a load of finite resistance. (5)

9. Draw the typical curves to show the variations of errors with input displacement for different values of load resistance. (5)
10. Explain any one of IC type temperature sensor with circuit diagram. (5)
11. Illustrate proximity transducer. (5)
12. Explain Vapour filled thermometers. (5)

**OR**

Explain parallel plate capacitive transducers. (5)

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