Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec– 2017**

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| **Code :** | **14EI2001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **SENSORS AND TRANSDUCERS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Classify the Applications of Measurement Systems. | CO1 | 8 |
| b. | A displacement measuring instrument is calibrated from 0 mm to 200 mm. The accuracy is specified within ±0.2% of instrument span. What is the maximum static error? | CO1 | 4 |
| c. | Identify the significance of loading effect in measuring instruments. | CO1 | 8 |
| (OR) | | | | |
| 2. | a. | An amplifier has an input signal voltage of 250 μV and a noise voltage of 2.5μV. Determine the signal to noise ratio. | CO1 | 5 |
| b. | Illustrate how the static and dynamic characteristics are used to assess performance of a measurement system. Examine on the static characteristics with examples. | CO1 | 15 |
|  |  |  |  |  |
| 3. | a. | Define transducer and outline the classification of transducers. | CO1 | 10 |
|  | b. | A multimeter having a sensitivity of 2 ,000Ω./V is used to measure the voltage across a circuit having an output resistance of 10 kΩ. The open circuit voltage of the circuit is 6V.Find the reading of the multimeter when it is set to its 10 V scale. Find the percentage error. | CO1 | 10 |
| (OR) | | | | |
| 4. | a. | Three resistors have the following ratings  R1=37Ω±5%, R2=75Ω±5%, R=50Ω±5%.  Determine the magnitude and limiting error in ohm and in percent if the resistances connected in series. | CO1 | 5 |
|  | b. | A flowmeter is calibrated from 0 to 100 m2/s. Tube accuracy is specified within ±0. 75 per cent of full scale reading. What is the maximum static error if the instrument reads 80m2/s. | CO1 | 5 |
|  | c. | Outline the importance of error analysis in measurement systems. Classify the errors in measurement and explain with suitable example. | CO1 | 10 |
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| 5. | a. | Classify strain gages based on their construction and give its applications. Derive the expression for gage factor of a strain gage. | CO2 | 10 |
|  | b. | Define Cold junction compensation. Illustrate the methods used for cold junction compensation in thermocouples. | CO2 | 10 |
| (OR) | | | | |
| 6. | a. | Explain how the positive temperature coefficient of resistance exhibited by metals can be used for temperature measurement. Give a brief account of the construction, working and the circuits involved. | CO2 | 10 |
|  | b. | A resistive potentiometer excited by 30V and total length 10m, produces an output of 5V when the input displacement is 2m. Determine the Sensitivity assuming ideal conditions. | CO2 | 10 |
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| 7. | a. | Bring out the application of variable reluctance principle to design an accelerometer. Illustrate the construction, principle and working of a variable reluctance accelerometer. | CO3 | 10 |
|  | b. | Mention the factors that influence the capacitance of a parallel plate capacitor. Show how this variation in capacitance can be used to measure displacement. | CO3 | 10 |
| (OR) | | | | |
| 8. | a. | Show how the principle of mutual inductance in a transformer is adopted to measure displacement in an LVDT. Explain its construction and working with neat sketches. | CO2 | 10 |
|  | b. | With a neat diagram, elaborate on the construction, principle and signal conditioning circuits of a capacitive transducer used for differential pressure measurement. | CO2 | 10 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | What is Hall Effect? With relevant diagrams and explanation, explain how the Hall Effect can be used as a displacement sensor and a current sensor. | CO2 | 10 |
|  | b. | Define the two sensitivity constants of piezo electric transducer.  Derive the relation between the two constants.  Also draw the equivalent circuit of piezoelectric transducer | CO3 | 10 |

ALL THE BEST