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

G:\logo and QP Template\logo 3 Feb 2018 final.tif

**End Semester Examination – Nov/Dec – 2018**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **17EI2001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **SENSORS AND TRANSDUCERS** | **Max. marks :** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain the functional blocks of a general measurement system with a suitable example. | CO1 | 12 |
| b. | Differentiate the following with an example each   1. Active and Passive Transducers 2. Direct and Inverse Transducers 3. Primary and Secondary Transducers | CO1 | 6 |
| c. | A thermometer is calibrated from 100C to 1100C. The accuracy is specified within ±0.1% of instrument span. What is the maximum static error? | CO2 | 2 |
| (OR) | | | | |
| 2. | a. | Bring out the importance of error analysis in measurement systems. Classify the errors in measurement and explain with suitable example. | CO2 | 10 |
| b. | Define Calibration and mention its importance in measurement applications. | CO2 | 4 |
| c. | Compare the efficacy of Single point, Two Point and Three Point Calibration. | CO2 | 6 |
|  |  |  |  |  |
| 3. | a. | Differentiate Static and Dynamic Characteristics. | CO4 | 4 |
| b. | A voltmeter has a uniform scale with 100 divisions. The full scale reading is 200V and 1/10 of a scale division can be estimated with a fair degree of certainty. Determine the resolution of the instrument. | CO4 | 4 |
| c. | Write the general equation of a first order system and derive its transfer function. Also determine the step response of the system and sketch the response. | CO4 | 12 |
| (OR) | | | | |
| 4. | a. | List the Static Characteristics of an Instrument. Explain the significance of each characteristic in selecting an Instrument for a specific application. | CO4 | 10 |
| b. | Define Transfer Function of a System and mention its importance in system analysis. | CO4 | 5 |
| c. | Determine the impulse response of a first order system. | CO4 | 5 |
|  |  |  |  |  |
| 5. | a. | Write the principle of working a Resistive Potentiometer. Explain its construction and illustrate its application for linear and angular displacement. | CO3 | 10 |
| b. | Explain the use of Wheatstone Bridge Circuit in Resistive Transducers. Compare the performance of Quarter and Bridge Circuits in terms of sensitivity by deriving the expression for Gage Factor. | CO2 | 10 |
| (OR) | | | | |
| 6. | a. | Define Strain. Explain the principle of working of a Strain Gage. and also derive the expression for Gage Factor. | CO3 | 10 |
| b. | Compare the working principle of RTD and Thermistor for Temperature Measurement with relevant diagrams and graphs. | CO3 | 10 |
|  |  |  |  |  |
| 7. | a. | Write the principle of operation of LVDT, its construction and working. | CO6 | 10 |
| b. | What is the use of phase sensitive demodulator circuit? Explain with relevant circuit diagrams. | CO6 | 10 |
| (OR) | | | | |
| 8. | a. | Write expression for Capacitance and mention its unit. | CO3 | 2 |
| b. | Show the different ways in which a capacitor can be used for displacement measurement | CO3 | 8 |
| c. | A thickness measuring system has a parallel plate capacitive sensor with a pair of plates of area 15cm x 25 cm and separated by a distance 0.03 cm. A mica sheet of thickness 0.01±0.001cm is passed between the plates. Calculate the variation of capacitance if the dielectric constant of mica is 8 and the permittivity of air is 8.85 x 10-12 Farads/m. | CO3 | 10 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. | a. | What is Hall Effect? Write the expression for Hall Voltage and mention a few applications of Hall Effect transducers. | CO6 | 10 |
| b. | Write a note on Smart Sensors and give their advantages. | CO5 | 10 |