Printed pages: 5	EE-305
(Following paper code and roll No. to be filled in your answer book)	
Paper code: 131303	Roll No.

B TECH
(SEM III) THEORY EXAMINATION 2014-15
SENSOR & INSTRUMENTATION

TIME: 3 Hours **Total Marks: 100**

Note: - Question No 1 to 5 are compulsory for student of all Branch **(CS/IT/EC/EI/IC/TT/ENV/CE/AG/CHE/ME)**. Question No 6 is **branch** specific and students are advised to attempt the part specific to their **branch.**

SECTION - A

1. Attempt all questions. All questions carry equal marks. 10X2

a. Differentiate between a transducer and inverse transducer with an example.
b. Define the working principal of K type thermocouple.
c. Describe the pin diagram of Op-Amp IC-741.
d. Explain various test signals used in measurement system.
e. Enlist the Applications of Multiplexer.
f. Differentiate LED and LCD display.
g. Define semiconductor strain gauge with its application.
h. What do you understand by Data logger?
i. Distinguish between accuracy and precision with example.

j. Draw a Sample/Hold (S/H) circuit

SECTION - B

2. Attempt any three parts of the following. All questions carry equal marks. 10×3

a. Explain the different factors on the basis of which transducer can be selected for a particular application.
b. (i) Draw and explain the main components of Cathode Ray Tube (CRT).
(ii)Explain all the basic components of an analog data acquisition system.
c. (i)Explain the working principle and construction of PMMC Type instruments?
(ii) Draw the general diagram of Telemetry System and explain each block.
d. Explain the concept of Smart Sensor. Describe any one type of flow sensor in brief.
e. The expected value of the voltage to be measured is 220 volts but the measurement gives a value of 200 volts. Calculate: (i) Absolute Error (ii) Percentage Error (iii) Relative Accuracy (iv) Percentage Accuracy.

SECTION – C

Note:-All questions are compulsory. All questions carry equal marks. 10×5

3. Attempt any two parts of the following 5X2

a. Why active filter are preferred over passive filters? Design a first order low pass filter with highest cut-off frequency 1 Khz.
b. With the help of neat diagram, explain operation of voltage to Frequency converter.
c. Differentiate between Modulation and Modulation Index. Discuss the square–law Modulator for amplitude modulation wave.

4. Attempt any two parts of the following 5X2

a. Discuss the working principle of LVDT with the help of neat sketch and characteristic.
b. Explain the operation of thermocouple sensor for the measurement of temperature.
c. Draw the circuit diagram of instrumentation operational amplifier. Derive the expression for voltage gain.

5. Attempt any two parts of the following 5X2

a. Derive expression of Gauge Factor as applied for a resistive strain gauge.
b. Explain the software feature of Lab VIEW and how it can be used to measure the input signal.
c. Write a short note on Digital filters

Note: - Question No 6 is **branch** specific and students are advised to attempt the part specific to their **branch.**

6. Attempt any two parts of the following 10X2

(Branch CS/IT/EL/EC/EI/IC) (Branch Code 10/13/30/31/32/33)

a. Draw a block diagram for Voltmeter and explain each function in details.
b. Describe the working of De Sauty Bridge (Capacitive Bridge) for the measurement of capacitance. Drive the equation for the balance equation.
c. For Q meter circuit is in resonance E=100mv, R=5Ω and $X_L=X_C=100\Omega$.
   (i) Calculate the coil Q and voltmeter indication

   (ii) Determine the Q factor and voltmeter indication for another coil that R=10Ω and $X_L=100\Omega$ at resonance.
d. Drive the balance equation for D'Arsonoval Bridge. Draw its circuit diagram with phasor diagram.

6. Attempt any two parts of the following 10X2
(Branch TT) (Branch Code 61)

a. Explain the Textile Instrumentation & Colorimeter.
b. Write the working principle of stroboscope & nep counting.
c. Explain the Instrumentation for computer Color matching.
d. Explain the functioning of tension meters?

6. Write short notes on any two of the following 10X2
(Branch ENV) (Branch Code 97)

a. Nano Sensors
b. Infrared absorption Spectroscopy
c. Application and monitoring of Sensor in Environmental Analysis.
d. Ionic chromatography for analysis of inorganic ions in water.

6. Attempt any two parts of the following 10X2
(Branch CE/AG) (Branch Code 00/80)

a. Define the term "Time Division Multiplexing" and "Frequency Division Multiplexing" in brief. Draw the block diagram of a complete telemetry scheme using frequency division multiplexing and de-multiplexing.
b. Write a short note on radio frequency telemetry.
c. With the help of suitable waveforms explain the working Pulse Amplitude Modulation (PAM) and Pulse Width modulation (PWM).

d. Discuss why frequency telemetry is considered superior to voltage or current telemetry.

6. Attempt any two parts of the following 10X2
(Branch CHE) (Branch Code 51)

a. Explain the principle, construction and working of Optical Pyrometers.
b. Explain the any type of monometers with a neat sketch.
c. Explain the thermal dying method of moisture measurement.
d. Write a short note on McLeod Gauge.

6. Attempt any two parts of the following 10X2
(Branch ME) (Branch Code 40)

a. Explain the principle and use of interferometery.
b. Explain the Taylor's principle of Gauge Design.
c. Explain the functioning of Tool maker's microscope?
d. Write a short note on measurement of screw threads and gears.