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B. Sc. in EEE , Semester: 6th/ B.Sc.Te, Semester: 2nd

Date: 6 March 2024
Time: 10.00 AM – 11:30 AM

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination
Course Number: EEE 4603/EEE 4693
Course Title: Measurement and Instrumentation

Summer Semester: 2022 - 2023
Full Marks: 75
Time: 90 minutes

There are **3 (three)** questions. Answer **all 3 (three)** questions. Marks of each question and the corresponding CO and PO are written in brackets

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1. a) Identify some common challenges and limitations associated with using electrons as the primary medium for sensing and measuring. Discuss potential future trends or technologies that may overcome these challenges and enhance electronic measurement systems and instrumentation. **8 (CO1) (PO1)**

   b) Derive the expression of Gauge Factor for strain gauge. Explain how the strain gauge can be utilized for road safety measurement. **7 (CO1) (PO1)**

2. a) Develop a system for remotely monitoring power consumption in a distributed facility. **15 (CO2) (PO2)**

   Provide outline measures and discuss the technologies to employ suitable current/power transducers with pulse or analog outputs to measure power usage. Provide methodological guidelines to integrate sensors, data loggers, and analysis techniques for capturing energy consumption data and how to utilize statistical analysis to analyze usage patterns and correlate them with power consumption trends.

   b) Develop a capacitive touch sensing system for user interfaces on a mobile. Explore the sensor selection, signal processing methods, and factors crucial for ensuring dependable touch detection and measurement in electronic devices. **15 (CO2) (PO2)**

   Provide outline measures and discuss the technologies to determine capacitive touch sensors tailored for user interfaces on a mobile. Employ signal processing techniques like charge integration to enable touch detection. Consider material selection and interference mitigation to ensure the reliability of capacitive touch sensing.

3. a) A Line Following Robot (LFR) has a feature to detect the obstacles on the track where IR proximity sensor has been used. Design the circuit diagram which will perform this obstacle detection. **7 (CO2) (PO2)**

   b) Explain the problems associated with the Maxwell bridge while measuring the inductance of high-quality factor and low-quality factors. **3 (CO1) (PO1)**

c) Use the following values of resistance versus temperature for an RTD to find the linear and quadratic approximations of resistance between 100°C and 130°C about a mean temperature of 115°C. **6 (CO2) (PO2)**

Temperature (°C)	Resistance (Ω)
90	562.66
95	568.03
100	573.40
105	578.77
110	584.13
115	589.48
120	594.84
125	600.18
130	605.52

d) Write short notes on Gas Filled Photocells. **4 (CO1) (PO1)**

e) Fig.3.(i) and Fig.3.(ii) both have the same voltage source. Calculate the value of R_X *and* L_X for Fig.3.(ii). The corresponding values of Fig.3.(i), $R_1 = 2.8k\Omega$, $R_2 = 20k\Omega$, $R_4 = 80k\Omega$, $C_1 = 4.8\mu F$ *and* $C_3 = 42.04pF$.The Corresponding values of Fig.3.(ii), $R_2 = 9k\Omega$, $R_1 = 1.8k\Omega$, $C_1 = 0.9\mu F$, $R_3 = 0.9k\Omega$. **10 (CO2) (PO2)**

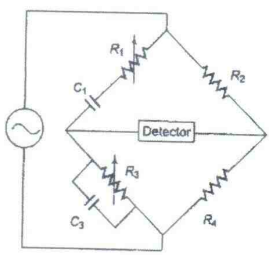

Fig.3.(i)

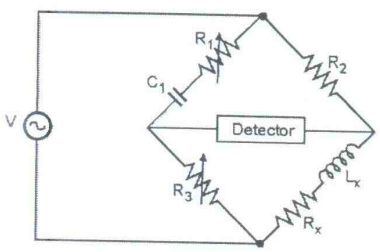

Fig.3.(ii)