

M.SC. INSTRUMENTATION SCIENCE FIRST YEAR SECOND SEMESTER EXAM- 2022

SUBJECT: INDUSTRIAL INSTRUMENTATION & DAS

Time: 4 Hours

Full Marks: 80

Use separate sheet for each part.

Part-I

Answer any 4 of the following questions.

1. a) Design a resistive potential divider of ratio 100:1 to measure 2000V DC in terms of 2 volts (0-2000mV) output. If the max current drawn by the potential divider is 200micro Amp what should be the values of upper (high voltage) and lower (low voltage) Resistances forming the potential divider.
b) What will be the error in measuring instrument has an input impedance of 50kOhm and c) Using which device this accuracy can be improved. [6+3+1]
2. a) What is isolation Transformer, explain its function with schematic diagram
b) Explain with circuit the function of an opto-couplers. [5+5]
3. a) Explain the ON/OFF characteristics of a solid state switch in Time domain.
b) Describe with diagram 4 input 1 output analog multiplexers along with PGA, ADC and corresponding control lines [6+4]
4. a) Describe Inductive and Capacitive Coupling with schematic diagram both for **field** and **network** model.
b) "Man made radiated noise mostly confined to low frequency (say power system of 50Hz frequency) the victims are always in the near field", explain briefly. [6+4]
5. a) Design a 3 stage Digitally Controlled inverting Gain Amplifier (x1, x10 and x 100) using Op Amp and analog switches with digital control input such that the amplification can be controlled by a micro controller.
b) When should we use Active rectifier circuit? [8+2]
6. Explain with diagram the function of a Hall current sensor and explain how the output of a Hall current sensor can be electrically isolated from the current carrying circuit. [10]

[Turn over

PART-II

Answer any four questions

4x10 = 40

1. What is the need of level measurement? List the different level measurement method. List the different methods of float type level measurement. Which material used for float?
2. Draw neat labelled diagram of optical pyrometer. Explain its working principle.
3. Draw and describe the working of RTD with applications in industry. Write the temperature range and material used for the following thermocouples J type, K type, R type, T type.
4. Define laminar flow, turbulent flow and Reynolds numbers. With the help of neat sketch, state working principle of ultrasonic flow meter.
5. Draw and describe the working of Diaphragm pressure transducer? Describe with neat diagram the working of bellows with application.
6. Write the definition and relationship between specific humidity, relative humidity, and dew point. Write the names of two types of instruments used for the direct and indirect measurement of humidity
Write the Use of the psychrometric chart for obtaining dew point and the weight of water vapor dissolved in the atmosphere from temperature data.
7. Write short notes(any two)
A. Stepper Motor B. Safety valves C. Measurement of Low pressure