

**M.SC. INSTRUMENTATION SCIENCE FIRST YEAR SECOND SEMESTER EXAM-2023**

**SUBJECT: INDUSTRIAL INSTRUMENTATION & DAS**

Time: 4 Hours

Full Marks: 80

Use separate answer script for each Part

**Part- I (40 Marks)**

**Answer any *Four* of the following**

1. a) What are the types of expansion thermometers?  
b) What is the standard operating temperature range for commercial and industrial application?  
c) With a neat diagram describe the working of a bimetallic thermometer with its applications. [2+2+6]
  
2. Explain in detail about different types of thermistors and its characteristics. 10
  
3. a) With a neat diagram explain the construction and working of a liquid filled glass thermometer.  
b) Explain junction compensation technique in Thermocouple. [7+3]
  
4. a) Discuss the operating principle and the construction of Mc-Leod Gauge with proper diagram.  
b) State the limitations of Mc-Leod Gauge utilization. [7+3]
  
5. a) What is the major difference of float level switch and displacer level switch measurement?  
b) What is 4-20mA signal protocol for industrial transmitter?  
c) Discuss the capacitive methods of level measurement and its industrial application [2+2+6]
  
6. Explain with proper diagram the mechanism and operation of Differential pressure type level measurement system with its application. [10]
  
7. Write short notes (any two) 5x2 = 10
  - a) Static characteristics of Instruments
  - b) Optical Pyrometer
  - c) U-tube manometer
  - d) Brown-Duvel Fractional Distillation Method

[ Turn over

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**PART II (40 Marks)**

Answer any 4 of the following questions.

1. a) Design a resistive potential divider of ratio 1000:1 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 10kOhm and c) Using which type of circuit this accuracy can be improved.  
[6+3+1]
2. a) Explain the ON/OFF characteristics of a solid state switch in Time domain.  
b) Describe with diagram 8 input 1 output analog multiplexers with control lines to make a 8 channel temperature scanner[6+4]
4. a) What are the three basic assumptions in circuit theory which are not strictly valid so far EMI phenomenon is considered.  
b) Describe Inductive and Capacitive Coupling with schematic diagram both for **field** and **network** model.
5. a) Explain with diagram the function of an opto coupler.  
b) Explain with schematic circuit why Optocouplers are required where power equipment is interfaced with Microcontroller based control System. [5+5]
6. Design with necessary schematic drawing a microcontroller based liquid level controller where the liquid outlet valve is closed and pump starts when the liquid level comes down just below the minimum liquid level and stops when the liquid level cross the max liquid level and the liquid outlet valve is opened as soon as the pump stops. Also write down the Algorithm of the control in proper manner.  
[5+5]