



RAN-2303080101060001

M.Sc. (Sem. - I) Examination November - 2025

Physics : Measurement and Industrial Instrumentation (Paper - PH-416)

Time: 2 Hours]
[Total Marks: 30
સૂચના : / Instructions

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book
- (2) Assume the data if required.
- (3) Figures to right hand side indicate marks of each question.
- (4) Attempt any two of each question

Seat No.:

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Student's Signature

- Q. 1** (a) (i) Explain the concept of Input-output configuration of measuring system with the help of specific illustration. **05**
- (ii) A second order instrument is required to measure the input signals up to 100 Hz with an amplitude inaccuracy of less than 1%. Calculate the natural frequency requirement, if the damping ratio is 0.3. Determine the phase shift at frequency of 50 Hz. **03**
- (b) (i) Define zero order instrument. Explain how the displacement measuring potentiometer working as zero order system. Derive the necessary expression of it. **03**
- (ii) Derive the step response of second order instrument for over damped case. **05**
- (c) (i) A temperature probe having first order response with a time constant of 1 second is given a step input of 50 °C from 0 °C. Calculate the temperature indicated 0.6 second after the application of the input. **04**
- (ii) State the methods of correction for interfering and modifying inputs. Explain in detail the method of signal filtering. **04**
- Q. 2** (a) (i) Draw the schematic diagram of laser anemometer flow measurement system and explain the working of it. **05**
- (ii) A capacitive transducer is constructed of two 1.0 (inch)² plates separated by a 0.01 inch distance in air. Calculate the displacement sensitivity of such an arrangement. The dielectric constant for air is 1.0006. **02**
- (b) (i) Explain the working of the following. **05**
- (1) Diaphragm gage
- (2) Bellows gage
- (ii) Explain the photoelectric effect. **02**
- (c) (i) Draw the schematic diagram of Differential transformer and explain the working of LVDT. **04**
- (ii) Calculate the incident radiation at 2μm that is necessary to produce a signal to noise ratio of 40 dB with a lead sulphide detector at room temperature, having an area of 1.0 (mm)². **03**
- Where $D^* = 1.5 \times 10^{11} \text{ cm} \cdot (\text{Hz})^{1/2} / \text{W}$ for $\Delta f = 1 \text{ Hz}$.