

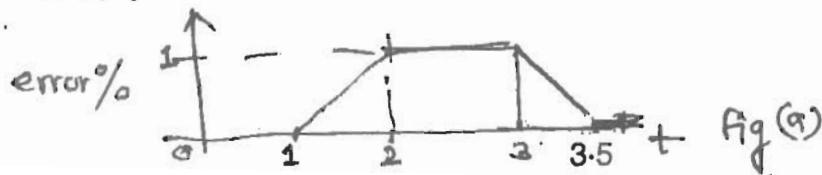
(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is **compulsory**.  
(2) Attempt any **four** questions out of remaining **six** questions.  
(3) Assume suitable **data** whenever **required**.  
(4) Illustrate answer with **sketches** whenever **required**.  
(5) **Figures to right** indicate **full marks**.

1. Attempt any **five** of the following :— 20
- (a) Define the terms process equation, process lag with suitable example.
  - (b) Explain the logarithmic compression used for signal conditioning in Instrumentation System.
  - (c) State the advantages of Electrical Transducer.
  - (d) Compare and contrast Reproducibility and Repeatability of an Instrument.
  - (e) What is calibration of an Instrument ? State its need.
  - (f) What are the objectives of Data Acquisition System ?
2. (a) Derive an equation for dynamic response of first order instrumentation system for Ramp input. Draw the response and explain the terms measurement error and lag. 10
- (b) Explain the construction, working principle and operation of Electromagnetic type of flow meter. 10
3. (a) Explain with neat block diagram multichannel data acquisition system to monitor temperature, flow, pressure, displacement, level and force. 10
- (b) Explain Distributed Control System (DCS) with neat diagram. 10
4. (a) Explain thermocouple for temperature measuring in view of (i) Material Used and Range (ii) Reference Junction Compensation (iii) Advantages and Disadvantages over other types of temperature transducers. 10
- (b) What are the advantages of Instrumentation amplifier ? Design three op-amp programmable gain Instrumentation amplifier for the gain of 10,100. 10
5. (a) What is LVDT ? Explain and draw the complete constructional diagram for it. State features and limitations of this transducer. Also explain the use of Phase Sensitive Detector (PSD) for operation of LVDT. 10
- (b) Explain in detail cascade controller with suitable example. State the advantages. 10

6. (a) For the error shown in figure (a) below, draw approximate PD Controller output as a function of time. (Range of controller o/p is 0–100%, at zero error controller output = 50%). 10



Also draw neat circuit diagram of PD Controller and derive the expression for controller output.

- (b) Design a second order active low pass filter for a cutoff frequency of 1 kHz. 10
7. Write short notes on any **two** of the following :— 20
- (a) Data logger
  - (b) pH measurement
  - (c) Control Valves : Classification and Characteristics
  - (d) Five point calibration procedure.