

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:3162005****Date:13-12-2023****Subject Name: Electro Mechanical Measurement and Instruments****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Define the terms measurement and instrumentation. **03**
 (b) Compare direct and indirect methods of measurement with suitable examples. **04**
 (c) Explain significance of measurement in detail with suitable examples. **07**
- Q.2** (a) Briefly explain calibration process for a measuring instrument. **03**
 (b) Explain any four dynamic characteristics of a measuring system. **04**
 (c) Draw block diagram of a generalized measurement system and explain function of each block. **07**

OR

- (c) Define the following static characteristics of a measuring instrument: **07**
 (i) Dead Time (ii) Accuracy (iii) Repeatability (iv) Backlash (v) Reproducibility
 (vi) Resolution (vii) Threshold
- Q.3** (a) Derive the expression for zero order system. **03**
 (b) Briefly explain second order system responses for step input, ramp input & sinusoidal input. **04**
 (c) Explain working and construction of RTD in detail with any one application. **07**

OR

- Q.3** (a) Draw block diagram of digital data acquisition system. **03**
 (b) Explain various modes of measurement. **04**
 (c) Explain working of permanent magnet moving coil instrument with sketch. **07**
- Q.4** (a) Compare thermocouple and thermistor. **03**
 (b) What are the factors which cause drift? Explain with suitable examples. **04**
 (c) Explain working and construction of hydraulic and pneumatic load cells with the help of sketches. **07**

OR

- Q.4** (a) A digital weight measuring instrument with a scale range of 0.0 kg to 20.0 kg shows a weight of 15.4 kg. The true value of the weight is 15.7 kg. Determine the values of absolute error and correction. Also express the error as a function of the true value. **03**
 (b) What are the various factors which affect the measuring process? **04**
 (c) What are primary standards? Explain important points which are to be considered for setting up the primary standard. **07**
- Q.5** (a) Write a short note on piezoelectric accelerometer. **03**
 (b) Explain working of hand speed tachometer with sketch. **04**
 (c) Explain inductive and capacitive transducers with examples. **07**

OR

- Q.5** (a) What are the various sources of errors in measurement? **03**
 (b) Write a short note on optical torsion meter. **04**
 (c) Explain working and construction of eddy current dynamometer with sketch. **07**
