# B 2338

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Fifth Semester

Mechanical Engineering

ME 332 — MEASUREMENTS AND CONTROLS

**Time** : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the functional elements of a measuring system?

2. Differentiate between primary and secondary calibration.

3. What is the role of amplifiers and filters in a measurement system?

4. What is a data logger?

5. What for seismic devices are used?

6. A load cell deflects 0.05 mm due to a machine tool slide whose mass is 200 kg. Find the highest frequency of force that may be measured with 5% accuracy.

7. Draw the schematic diagram of a hydraulic servomotor.

8. Derive the transfer of a simple proportional controller.

9. What is a pressure snubber?

10. Mention the principle of a vortex flow meter?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the different types of errors and uncertainties in performance parameters of an instrument. How are they estimated?

Or

(b) Differentiate the hysteresis loop due to coulombs friction and hysteresis loop due to viscous friction. Also explain how drift effects the sensitivity of an instrument.

12. (a) A pressure transducer has a natural frequency of 4 Hz, damping ratio 0.2 and static sensitivity of 0.2 $\mu$V/Pa. For a step pressure input of $10^6$ Pa find the output at t = 0.1 and 1.0 s. Also find the peak overshoot value. Find the output amplitude and phase relative to the input for a harmonic input of amplitude $5 \times 10^5$ Pa at frequency 10 Hz.

Or

(b) Draw and explain the constructional features of a CRO. Also explain how the line base may be used for phase measurement.

13. (a) (i) What are Elastic force devices? Derive the relation between strain and stiffness. (8)

(ii) Explain multiposition controls with an example. (8)

Or

(b) Explain the optical principle for measuring very small motions. Draw and explain the optical interferometer.

14. (a) Develop the flow diagram of a fluid temperature control system using feedback principle. Also derive the transfer function in term of the output temperature.

Or

(b) What is the principle of an armature controlled motor? Draw and explain with the aid of a block diagram.

15. (a) How Tachometers are classified as mechanical and electric for speed measurement? Explain in detail any one type of tachometer for each classification.

Or

(b) What are the various parameters regarding flight control? Develop the fundamental equation governing flight control.

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