

C 3222

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

Fifth Semester

Mechatronics Engineering

EE 1311 — INSTRUMENTATION AND CONTROL SYSTEM

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between the terms "Scale Range" and "Scale Span" giving suitable examples.
2. How transducers are classified?
3. State the law of intermediate metals.
4. List the applications of thermoelectric laws.
5. What are the limitations of electromagnetic flow meters?
6. Write short note on mounting of orifice.
7. Define gauge factor of a strain gauge.
8. Why electrical tachometers are preferred over mechanical tachometers in measuring angular velocity?
9. Under what circumstances a PID controller is preferred for controlling a process.
10. Give the range of pneumatic controller output.

PART B — (5 × 16 = 80 marks)

11. (a) (i) With a neat block diagram, Explain in detail about the functional elements of a generalized measurement system. (12)
- (ii) Write notes on :
 - (1) Relative error
 - (2) Percentage relative error. (4)

Or

- (b) (i) How measuring instruments are categorized as zero order, first order and second order instruments? (6)
 - (ii) Discuss in detail about step response of first order instruments. (10)
12. (a) Explain in detail the construction and principle of operation of thermocouples. Also describe the thermoelectric laws and their applications. (16)

Or

- (b) With necessary sketches, Discuss in detail about construction and working of Biometallic thermometers. Also derive an expression for its radius of curvature. (16)
13. (a) (i) With a neat sketch, Explain in detail about the construction and working of bourdon tube pressure gauge. (12)
- (ii) Which one of the Ionization gauge is considered better and on what considerations? (4)

Or

- (b) (i) Briefly discuss about the principle involved in low pressure measurement using thermal type gauges. (5)
 - (ii) Explain in detail about construction and working of Ionization gauge with necessary diagrams. (11)
14. (a) (i) How strain gauge can be used for measurement of Torque. Discuss in detail with necessary circuit diagrams. (10)
- (ii) How is phase shift compensated in an LVDT type displacement measuring scheme? What is the effect of this phase shift? (6)

Or

- (b) What are load cells? Explain the construction and working of magneto elastic type load cell and a strain gauge load cell with necessary sketches. How do they differ in operation aspects?
15. (a) With necessary sketches, discuss in detail about the principle and working of pneumatic two step controller. Also list the areas of its applications. (16)

Or

- (b) Explain in detail about the following :
 - (i) Electronic PID controller (8)
 - (ii) Pneumatic PID controller. (8)