

R 8251

TECH. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Fifth Semester

Mechatronics Engineering

EC 339 — SENSOR AND SIGNAL PROCESSING

Time hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

Compare resolution and threshold.

Define the term linearity.

List out the advantages of thermocouples.

State piezoelectric effect.

The slow rate of operational amplifier is $20 \text{ V}/\mu\text{s}$. The operational amplifier has saturation voltages of $\pm 10 \text{ V}$, calculate the maximum switching time from the saturation region to the other.

Find the successive approximation A/D output for a 4 bit converter to a 9.217 V input, if the reference is 5 V .

What is the function of digital filtering?

Draw a neat sketch of single channel data acquisition system.

List the important features of the IEEE 488 bus.

Draw a pin diagram of RS 232 C Standard.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Draw the block diagram representation of a generalized measurement system and explain each block with suitable examples. (16)
- (ii) Explain the importance of time delay. (6)

Or

- (b) Derive the mathematical model of a first order system with step input and sinusoidal input and also draw the response. (8 + 8)

12. (a) (i) Derive the gauge factor of a strain gauge. (8)
- (ii) Draw and describe the following are thermistors.
Voltage – current characteristics
Resistance – temperature characteristics. (4 + 4)

Or

- (b) (i) Two plates of parallel plate capacitive transducer are 30 mm apart and the space is filled with two different dielectric materials, one material is 1 cm thick with a dielectric constant of 5 and the other material is 70 mm thick with a dielectric constant of 10. If the capacitive transducer were to be made up of a single dielectric material, what is the dielectric constant of that material? (8)
- (ii) Explain the working principle of radiation pyrometry with suitable diagram. (8)

13. (a) Explain with suitable diagrams of the following operational amplifier circuits.
- (i) attenuated feedback (6)
- (ii) logarithmic converter (5)
- (iii) limiter. (5)

Or

- (b) Write short notes on :
- (i) Sample and Hold circuit (8)
- (ii) Dual Slope ADC. (8)

Describe the working principle of PC based data acquisition system with
diagram. (16)

Or

Explain the working principle of a μ p based data logger. (16)

Describe in detail the IEEE 488 with a suitable application. (16)

Or

Write short notes on :

(i) British Standard interface BS 4421 (8)

(ii) Media Interface. (8)