

M.E. / M.TECH. DEGREE EXAMINATIONS, DEC 2020 (Held during April, 2021)

First Semester

MS18103 – SENSORS AND ACTUATORS

(Mechatronics)

(Regulation 2018)

Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions

**PART A - (8 X 2 = 16 marks)**

1. The time constant is \_\_\_\_\_ % of response time.
  - (a) 93.6
  - (b) 63.2
  - (c) 36.3
  - (d) 50.0
2. A pot is a \_\_\_\_\_ type transducer.
  - (a) Resistive type
  - (b) Capacitive type
  - (c) Inductive type
  - (d) All the above
3. \_\_\_\_\_ establishes a relation between the change in the resistance applied and the strain.
  - (a) Wheatstone bridge
  - (b) Strain gauge
  - (c) Potentiometer
  - (d) Gauge factor
4. The effect of the measurand on the light being transmitted take place in the fiber Haze and operational system is called as
  - (a) Intrinsic
  - (b) Extrinsic
  - (c) Both the above
  - (d) None of the above
5. State the difference between a sensor and a transducer and mention any two examples for each.
6. When do you need a signal conditioner? And show the same with a neat block diagram.
7. List the basic transducing principles and quote the suitable principle for force measurement.
8. What are best suited materials to build a thermocouple?

**PART B - (4 X16 = 64 marks)**

09. (a) (i) Suggest a sensor that could be used, as part of a control system, to determine the difference in levels between liquids in two containers. The output is to provide an electrical signal for the control system. Explain its working with a neat sketch. **(10)**
- (ii) Explain the method to analyse uncertainty of errors in measurement. **(6)**
- (OR)**
- (b) (i) What is the non-linearity error, as a percentage of full range, produced when a 1 k $\Omega$  potentiometer has a load of 10 k $\Omega$  and is at one-third of its maximum displacement? **(8)**
- (ii) Identify the primary elements used in process control system and explain them in detail with a suitable example. **(8)**
10. (a) (i) You are offered a choice of an incremental shaft encoder or an absolute shaft encoder for the measurement of an angular displacement. What is the principal difference between the results that can be obtained by these methods? **(10)**
- (ii) Why is the Gray code preferred to binary code in commercial encoders? How is Gray code converted to binary code? **(6)**
- (OR)**
- (b) Draw the schematic diagram of an LVDT and explain its electromechanical transfer characteristics. Show an arrangement to extract the amplitude as well as the phase information contained in the ac output of an LVDT. **(16)**
11. (a) (i) Write a short note on a solid-state device which converts magnetic or magnetically encoded information into electrical signals with a neat sketch. **(8)**
- (ii) Discuss the scheme for measurement of pressure using strain gauge with a neat sketch. **(8)**
- (OR)**
- (b) Explain the working principle of a heading sensor and explain any two heading sensors in detail. **(16)**
12. (a) Suggest a light sensor which can be used as audio compressor or fire alarm and explain its working principle with neat sketches. **(16)**
- (OR)**
- (b) Explain how bellows and diaphragms are employed to measure pressure with neat sketches. **(16)**