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M.E. / M.TECH. DEGREE EXAMINATIONS, MAY 2019

Second Semester

IC18203-INSTRUMENTATION FOR THERMAL SYSTEMS*(Internal Combustion Engineering)***(Regulation 2018)****Time: Three Hours****Maximum : 100 Marks**

Answer ALL questions

PART A - (10 X 2 = 20 Marks)

1. Define time constant.
2. What is meant by uncertainty analysis?
3. What kinds of problems can be encountered in thermocouple use?
4. What are the types of flowmeters available and give an example for variable area flow meter?
5. What is meant by a positive displacement flow meter? Give example.
6. What is the advantage of laser anemometer?
7. What is meant by "isokinetic sampling"?
8. What is the range of sizes of most atmospheric particulate matter?
9. In what kinds of situations would data transmissions be necessary?
10. Give examples for closed loop control system

PART B - (5 X16 = 80 Marks)

11. (a) (i) How can an uncertainty analysis help to reduce overall experimental uncertainty? **(8)**
- (ii) What is meant by zeroth, first, and second-order systems? **(8)**

(OR)

- (b) A certain obstruction-type flowmeter (orifice, venturi, nozzle) is used to measure the flow of air at low velocities. The relation describing the flow rate is **(16)**

$$\dot{m} = \left[\frac{2p_1}{RT_1} (p_1 - p_2) \right]^{\frac{1}{2}}$$

Where, $C = 0.92 \pm 0.005$, $p_1 = 25 \text{ kg/cm}^2 \pm 0.5 \text{ kg/cm}^2$, $T_1 = 70^\circ\text{C} \pm 2^\circ\text{C}$,
 $dp = p_1 - p_2 = 1.4 \text{ kg/cm}^2 \pm 0.005 \text{ kg/cm}^2$, $A = 1.0 \text{ mm}^2 \pm 0.001 \text{ mm}^2$.

12. (a) (i) Describe the resistance characteristics of thermistors. (8)
- (ii) Describe the method of temperature measurement by radiation. (8)
- (OR)**
- (b) (i) Explain vortex- shedding and ultrasonic flow meters. (8)
- (ii) Describe the principle of operation of a McLeod gage. (8)
13. (a) (i) Explain the principle of gas chromatograph. (8)
- (ii) Explain the principle of non-dispersive infrared analyser. (8)
- (OR)**
- (b) (i) Explain the principle of turbine flow meter with a neat sketch. (8)
- (ii) Describe the principle of operation of a hot wire anemometer. (8)
14. (a) (i) Describe the colorimetry analysis process for SO₂. (8)
- (ii) Discuss the principle of operation of an electrostatic precipitator? (8)
- (OR)**
- (b) Distinguish between source and ambient air-pollution standards. What are the advantages of each? (16)
15. (a) Explain the basic elements of an open loop and closed loop control systems. (16)
- (OR)**
- (b) Explain in detail the functions and objectives of computer-based data acquisition systems. (16)