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M.E. / M.TECH. DEGREE EXAMINATIONS, MAY/JUNE 2017

SECOND SEMESTER

INTERNAL COMBUSTION ENGINEERING

IC16203 – INSTRUMENTATION FOR THERMAL SYSTEMS

(Regulation 2016)

Q. Code: 537885

Time: Three Hours

Maximum : 100 Marks

Answer ALL questions

PART A - (10 X 2 = 20 marks)

1. Distinguish between random and systematic errors.
2. What is regression analysis?
3. What is a PT-100 thermometer?
4. Define dynamic response of a U-tube manometer.
5. Write the working principle of Laser Doppler Anemometer.
6. Name the components of gas chromatograph.
7. What is a feedback loop?
8. What is a stepper motor? Where is it used?
9. Define signal conditioning.
10. Differentiate between timer and counter.

PART B - (5 X16 = 80 marks)

11. (a) The following data is expected to follow a relation of the form $y = ax + b$. **(16)**
Determine the fit parameters using linear regression. Comment on the goodness of the fit.

x	0.9	2.3	3.3	4.5	5.7	6.7
y	1.1	1.6	2.6	3.2	4.0	5.0

(OR)

- (b) (i) Two resistances R_1 and R_2 are given as $1000 \pm 25 \Omega$ and $500 \pm 10 \Omega$. Determine the equivalent resistance when these two are connected in a) series and b) parallel. Also determine the uncertainties in these two cases. **(10)**

- (ii) The volume of a sphere is estimated by measuring its diameter by vernier calipers. In a certain case the diameter has been measured as $D = 0.0502 \pm 0.00005$ m. Determine the volume and specify a suitable uncertainty for the same. (6)
12. (a) (i) Write laws of thermoelectric circuits. (4)
(ii) With neat sketches explain in detail any two methods of measuring pressure. (12)
- (OR)**
- (b) (i) Derive an expression for volume flow rate for a rotameter. (6)
(ii) Describe the working of any two flow measuring instruments with neat sketches. (10)
13. (a) (i) What are the two ways of using the hot wire probe? (4)
(ii) Discuss in detail any two anemometers with neat sketches. (12)
- (OR)**
- (b) (i) Write short notes on smoke meter. (4)
(ii) Describe the working of any two gas analysers with neat sketches. (12)
14. (a) (i) Define transfer function. (2)
(ii) What are basic elements of closed loop system? Describe the system with examples and neat sketches. (14)
- (OR)**
- (b) (i) Discuss dynamic characteristics of a control system. (6)
(ii) What are the various types of controllers? Discuss any two controllers with sketches. (10)
15. (a) (i) What are the elements of computer interfacing? (2)
(ii) Discuss in detail some of the User Interfaces used nowadays. (14)
- (OR)**
- (b) (i) Discuss some of the applications of Analog-to-Digital and Digital-to-Analog converters. (6)
(ii) What is data acquisition? Describe the methodology of data acquisition system with a schematic sketch. (10)