

B.TECH. SEM -VII MECHANICAL 2014 COURSE (CBCS) :

SUMMER - 2018

SUBJECT: ELECTIVE-II

EXPERIMENTAL METHODS IN MECHANICAL ENGINEERING

Day: **Friday**
Date: **25/05/2018**

S-2018-2522

Time: **02.30 PM TO 05.30 PM**
Max Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data, if necessary.

Q.1 Explain the behavior of second-order instrument with the help of a differential equation and a block diagram. **(10)**

OR

Q.2 In a process that manufactures aluminum cans, the probability that a can has a flaw on its side is 0.02, the probability that a can has a flaw on its top is 0.01 and the probability that a can has a flaw on both the side and the top is 0.01. What is probability that a randomly chosen can has a flaw?
What is probability that it has no flaw? **(10)**

Q.3 Derive the least squares fit of the following model: $y = a_1x + e$, with $a_0 = 0$ in a mathematical expression for straight line: $y = a_0 + a_1x + e$, where a_0 and a_1 are coefficient representing intercept and slope respectively and e is error or residual. **(10)**

Fit the following data with this model:

x	2	4	6	7	10	11	14	17	20
y	1	2	5	2	8	7	6	9	12

OR

Q.4 Fit the following experimental data in an exponential model $y = ae^{bx}$. **(10)**

x	0.4	0.8	1.2	1.6	2.0	2.3
y	800	975	1500	1950	2900	3600

Q.5 What are the various stages in experimental investigations? **(10)**

OR

Q.6 Why planning of experiments is required? **(10)**
Explain ANOVA table and its application in Design of Experiments.

P.T.O.

Q.7 Explain various types of errors occurring during experimentation? **(10)**

OR

Q.8 Consider a flow of fluid through a circular pipe of diameter D . Let ρ be the density, Q be the discharge of fluid and Δp be the pressure drop during its travel through length L . **(10)**

The friction factor f is given by

$$f = (\pi^2 D^5 \Delta p) / (8 \rho Q^2 L)$$

If uncertainty in measurement of all variables is within $\pm 1\%$, find the uncertainty in measurement of friction factor f using Taylor's Series Method (TSM) which is also known as Partial Differentiation Method (PDM).

$$\rho = (1000 \pm 1\%) \text{ kg/m}^3 \quad D = (0.05 \pm 1\%) \text{ m}$$

$$Q = (0.003 \pm 1\%) \text{ m}^3/\text{s} \quad L = (0.2 \pm 1\%) \text{ m}$$

$$\Delta p = (80 \pm 1\%) \text{ Pa}$$

Q.9 With the help of neat sketches explain Shadowgraphy and Schlieren techniques. **(10)**
What is the difference between these techniques?

OR

Q.10 Explain construction, working and application of Orsat Apparatus with the help of a neat sketch. **(10)**

Q.11 Explain the following characteristics of a Data Acquisition System: **(10)**

- i) Analogous input
- ii) Sample speed
- iii) Accuracy
- iv) Linearity
- v) Resolution

OR

Q.12 For an experiment on measurement of efficiency of a LPG stove, what factors should be considered while selection of a Data Acquisition System? **(10)**
Suggest various measuring instruments for taking different measurements in the above experiment.

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