B.TECH. SEM -VII MECHANICAL 2014 COURSE (CBCS) :
WINTER - 2017
SUBJECT: ELECTIVE-II
EXPERIMENTAL METHODS IN MECHANICAL ENGINEERING

Day: **Monday** Time: **02.30 PM TO 05.30 PM**
Date: **22/01/2018** Max Marks: 60

W-2017-2317

N.B.:

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

Q.1 With the help of a differential equation and a block diagram explain the behavior of first-order instrument. **(10)**

OR

Q.2 A Gaussian distribution has a mean μ of 5.00 and standard deviation σ of 1.00. Find the probability of a single measurement from this distribution being: **(10)**

i) Between 4.5 and 5.75
ii) Between 6.0 and 7.0

Use the following table of two tailed Gaussian probabilities:

z	0.5	0.75	1.0	1.5	2.0
$\phi(z)$	0.6915	0.7664	0.8413	0.9332	0.9772

Q.3 Use least squares regression to fit a straight line to the following experimental data: **(10)**

x	1	2	3	4	5	6	7	8	9
y	1	1.5	2	3	4	5	8	10	13

Also compute the standard error of the estimate and a correlation coefficient.

OR

Q.4 Use multiple linear regression to fit the following experimental data in the model: $y = a_0 + a_1x_1 + a_2x_2 + e$. **(10)**

x_1	0	0	1	2	0	1	2	2	1
x_2	0	2	2	4	4	6	6	2	1
y	14	21	11	12	23	23	14	6	11

Compute the coefficients, the standard error of the estimate and a correlation coefficient.

Q.5 Write a short note on Taguchi Method in Design of Experiments. **(10)**

OR

Q.6 Explain use of Response Surface Methodology (RSM) in Design of Experiments. **(10)**

P.T.O.

Q.7 Explain the procedure for estimation of error in a multivariable system using Taylor's Series Method (TSM) which is also known as Partial Differentiation Method (PDM). **(10)**

OR

Q.8 While performing an experiment on three LPG stoves viz. A, B and C, following water boiling efficiencies were obtained. Each experiment was repeated five times: **(10)**

Expt. No.	Efficiency (%)		
	Stove A	Stove B	Stove C
1	60	39	45
2	51	48	42
3	48	51	51
4	54	54	45
5	42	42	48

Using student's t-test method, find sample standard deviation in efficiency of each stove at 95% confidence level.
Use the extract of following t-table for t-values:

Degree of freedom	t-value at 95% confidence level
1	6.314
2	2.920
3	2.353
4	2.132
5	2.015

Q.9 Explain construction, working and application of Gas Chromatograph with the help of a neat sketch. **(10)**

OR

Q.10 Explain construction, working and application of Laser Doppler Anemometer with the help of a neat sketch. **(10)**

Q.11 With the help of neat sketches, explain operation of A/D converter in Data Acquisition System. **(10)**

OR

Q.12 For an experiment on measurement of effectiveness of a counter flow heat exchanger, how will you select a Data Acquisition System? **(10)**
Suggest various measuring instruments for taking different measurements in the above experiment.