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Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(ME) (Sem.–2)

RESEARCH METHODOLOGY

Subject Code : MME-502

M.Code : 38203

Time : 3 Hrs. Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

Q1. a. Define hypothesis and illustrate the formation of hypothesis using a practical example.

b. Explain the concept of interaction between two factors, A and B through an example with suitable graphs.

Q2. a. Give the model of ANOVA with single factor and explain its components.

b. Explain the concept of synergism and antagonism with an example.

Q3.

a. Explain the model and the components of Latin square design with an example.

b. List and explain the steps of Duncan's multiple range tests.

Q4. The R and D manager of a manufacturing firm is in a state of dilemma whether the sales revenue is affected by sales region. Because there might be variability from one period to another period, he decided to use the randomized complete block design by taking the period as block. The corresponding data are presented below :

Sales region

Period	A	B	C	D	E	F
1	18	9	15	22	9	10
2	25	7	14	18	28	13
3	20	8	12	9	15	17
4	11	13	30	12	20	23
5	18	11	25	1	16	8
6	24	30	17	16	20	30

a. Write the corresponding model.

b. Check whether each component of the model has effect on the sales revenue at a significance level of 5%.

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Q5. The number of gamma rays emitted per second by a certain radioactive substance is a random variable having the poisson distribution with $\lambda = 5.8$. If a recording instrument becomes inoperative when there are more than 12 rays per second, what is the probability that the instrument becomes inoperative during any given second?

Q6 A chemical company wishes to study the effect of extraction time on the efficiency of an extraction operation, obtained the data shown in table :

Extraction Time (Minutes) X	**Extraction Efficiency (%) Y**
27	57
45	64
41	80
19	46
35	62
39	72
19	52
49	77
15	57
31	68

a. Draw a scatter plot to verify that a straight line will provide a good fit to the data, draw a straight line by eye and use it to predict the extraction efficiency one can expect when extraction efficiency is 35 minutes.

b. Fit a straight line to the given data by the method of least square and use it to predict the extraction efficiency one can expect when the extraction time is 35 minutes.

Q7. Write the model of the following experiments and also explain their components:

a. Factorial experiments with 2 factors

b. Factorial experiments with 3 factors

c. Factorial experiments with 4 factors

Q8. Write short note on the following :

a. Preparation of thesis (Discuss the content list with example)

b. Chi-square distribution.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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