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Total No. of Pages : 02

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M.Tech.(ME) (Sem.–2)

RESEARCH METHODOLOGY

Subject Code : MME-502

Paper ID : [E0402]

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. A biomedical device for medical emergencies can operate for 0, 1 or 2 times a night. Construct a tree diagram to show that there are 10 different ways that it can be operated for a total of 6 times over 4 nights.

b. Use the Poisson distribution to approximate the binomial probability b (3; 100,0.03).

Q2. a. Specifications for a certain job call for washers with an inside diameter of 0.300±0.005 inch. If the inside diameter of the washers supplied by a given manufacturer may be looked upon as a random variable having the normal distribution with $\mu = 0.302$ inch and σ=0.003 inch, what percentage of these washers will meet specifications?

b. What is the significance of ANOVA?

Q3. The time to repair an electronic instrument is a normally distributed random variable measured in hours. The repair times for 16 such instruments chosen at random are as follows :

Hours

159	280	101	212
224	379	179	264
222	362	168	250
149	260	485	170

a. You wish to know if the mean repair time exceeds 225 hours set up appropriate hypothesis for investigating this issue

b. Test the hypothesis you formulated in part (a). What are your conclusions? Use α= 0.05

c. Construct a 95 percent confidence interval on mean repair time.

Q4. Engineers fabricated a new transmission type electron multiplier created an array of silicon Nano pillars on a flat silicon membrane. The precise structure can influence the electrical properties so, subsequently, the height and width of 50 Nano pillars were measured in nano-meters (nm) or 10^{-9} meters. The summary statistic, with x=width and y = height are :

n =50, $\bar{x}$ = 88.34, $\bar{y}$ = 305.58, S_{xx} = 7239.22, S_{xy} = 17840.1, S_{yy} = 66975.2

a. Find the least square line for predicting height for width.

b. Find least square line for predicting width from eight.

Q5. The following data pertain to the resistance (ohm) and the failure time (minutes) of certain overloaded resistors :

Resistance	Failure time	Resistance	Failure time
43	32	3	3
29	20	39	33
44	45	36	21
33	35	47	44
47	46	28	26
34	28	40	45
31	26	42	39
48	37	33	25
34	33	46	36
33	22	28	25
46	47	48	45
37	30	45	36

Calculate 'r'.

Q6. a. Discuss the application of experimental design in finance function of a company.

b. Explain the theory of testing of hypothesis using *'F'* test.

Q7. Explain the model and components of the randomized complete block design with example.

Q8. a. Describe the characteristics and logical formal for writing a research thesis and research papers.

b. What is student't'- test and explain its importance?