

Roll No.

Total No. of Pages : 03

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M.Tech. (EE)(2013 Onwards)/(Power System) (2013 & Onwards) (Sem.-1)

RESEARCH METHODOLOGY

Subject Code : MTRM-101

M.Code : 70729

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

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

1. Describe the important research design used in experimental hypothesis -testing research study? (20)
2. a) Find the mean deviation from the mean for the following data : (10)

Class interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	12	10	8	3	2	7

- b) In the frequency distribution of 100 families given below, the number of families corresponding to expenditure groups 20 - 40 and 40 - 60 are missing from the table. However, the median is known to be 50. Find the missing frequencies. (10)

Expenditure	0-20	20-40	40-60	60-80	80-100
No. of families	14	?	27	?	15

3. a) Find the Karl Pearson's coefficient of correlation between x and y for the following data : (10)

x	10	7	12	15	9	15	8
y	6	4	7	10	11	8	10

- b) If the two lines of regression are $4x - 5y + 30 = 0$ and $20x - 9y - 107 = 0$. Which of these is the line of regression of x on y and y on x. Find correlation coefficient and standard deviation of y if the standard deviation of x is 3. (5)
- c) The mean and S.D. of a sample of size 10 were found to be 9.5 and 2.5 respectively. Later on an additional observation becomes available. This was 15.0 and was included in the original sample. Find the mean. (5)

4. a) The theory predicts the proportion of beans, in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? (The table value of χ^2 for 3 d.f. at 5% level of significance is 7.81). (10)
- b) Samples of sales in similar shops in two rooms are taken for a new product with the following results : (10)

Town	Mean sales	Variance	Size of samples
A	57	5.3	5
B	61	4.8	7

Is there any evidence of difference in sales in the two towns? Use 5% level of significance for testing this difference between the mean of two samples. Use $t_{10} (0.05) = 2.228$

5. What do you understand by the Research proposal? Give the structure of Research proposal. Enumerate the criteria for evaluating the Research proposal. (20)
6. a) A manufacturing company has purchased three new machines of different makes and wishes to determine whether one of them is faster than the others in producing a certain output. Five, hourly production figures are observed at random from each machine and the results are given as below: (10)

	Machine A	Machine B	Machine C
Observations	25	31	24
	30	39	39
	36	38	28
	38	42	25
	31	35	28

Use analysis of variance technique and determine whether the machines are significantly different in their mean speed at the 5% level of significance. Given $F_{0.05}(2, 12) = 3.89$

- b) Complete the following randomized block design table. (10)

Source of variations	d.f.	Sum of Squares (SS)	Mean sum of squares (MSS)	F-ratio
Blocks	4	26.8	-	-
Treatments	3	-	-	-
Error	-	-	2.5	-
Total	-	85.3		

7. a) Suppose that the life length of the two bulbs B1 and B2 have distribution $N(x; 40, 36)$ and $N(x; 45, 9)$ respectively. If the bulb is to be used for 45-hour period, which bulb is to be preferred? If it is to be used for 48-hour period, which bulb is to be preferred? Given that $P(Z < 0.83) = 0.7967$, $P(Z < 1.33) = 0.9082$, $P(Z < 1.00) = 0.8143$. (10)
- b) Service calls come to a maintenance center, according to a Poisson process and, on the average, 2.7 calls come per minute. Find the probability that : (10)
- i) no more than 4 calls come in any minute
 - ii) fewer than 2 calls came in any minute
 - iii) more than 10 calls come in a 5-minute period
8. Discuss the basic requirement of report preparation, including report format, report writing, graphs and tables. (20)

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.