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NATIONAL INSTITUTE OF TECHNOLOGY HAMIRPUR

Department of Mathematics & Scientific Computing

End-semester examination

Class: B. Tech – 4th Semester

Course Title: Statistical Methods

Course code: MA-222

Maximum Marks: 50

Time: 3:00 Hours

Note: All questions are compulsory and carry equal marks (5).

Q.1 A random sample of eight drivers insured with a company and having similar auto insurance policies was selected. The following table lists their driving experiences (independent variable) and monthly auto insurance premiums (dependent variable).

Driving experience (in years)	5	2	12	9	15	6	25	16
Monthly Auto insurance premium	64	87	50	71	44	56	42	60

- a) Is there positive or negative relationship between these two variables?
b) Find the least squares regression line.

Q.2 The time taken by 50 students to complete a 100 meter race are given below. Find its standard deviation by step deviation method and also find coefficient of variation.

Time taken	8.5 - 9.5	9.5 - 10.5	10.5 - 11.5	11.5 - 12.5	12.5 - 13.5
f_i	6	8	17	10	9

Q.3 Two reserchers adopted different sampling techniques while investigating the same group of students to find the numbers of students falling in different intelligence levels. The results are as follows

Reseacher	No. of students on each level			
	Below average	Average	Above average	Genius
X	86	60	44	10
Y	40	33	33	2

Are the sampling techniques adopted by the two researchers are significantly different?

Q.4 Explain the meaning of "Analysis of variance" and give its uses. State the basic assumptions in the analysis of variance. Give the various steps in carrying out the ANOVA of a two-way classified data.

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- Q. 5** Four processes A, B C and D are tested to see whether their average outputs are equivalent. The following observation of output are made.

Processes	Average Output				
A	55	49	42	21	52
B	61	112	30	89	63
C	42	97	81	95	92
D	169	137	169	85	154

Carry out the 'Analysis of Variance' and state your conclusion. If there is found any significant difference between these processes, do pairwise comparison using LSD Test. (F -Table value at 5% Level of significance = 3.06, t-table value = 2.12)

- Q.6** A population consist of five numbers 3,6,9,12 and 15. Draw a possible sample of size 2 from the sampling distribution of sample mean and verify the results

1. $E(\bar{x}) = \mu$

2. $Var(\bar{x}) = \frac{\sigma^2}{n} \left(\frac{N-n}{N-1} \right)$

- Q.7** Define order statistics. Consider 5 random variables X_1, X_2, X_3, X_4, X_5 , all having uniform distribution. Calculate 3rd Order statistics. The pdf and cdf of uniform distribution are

$$f_x(x) = \begin{cases} 1; & 0 \leq x \leq 1 \\ 0; & \text{otherwise} \end{cases}, \quad F_x(x) = \begin{cases} 0 & ; x \leq 0 \\ x & ; 0 \leq x \leq 1 \\ 1 & ; \geq 1 \end{cases}$$

- Q. 8** There are 8 groups and having 3 observations of each, mean of group A, B, C, D, E, F, G, and H are 79.67, 84, 91.67, 82, 76, 74, 84.33 and 83.67 respectively. MSE is 7.83 and error df is 14. Apply DMRT Test and draw conclusion. (Table values are : 3.03, 3.18, 3.27, 3.33, 3.37, 3.39, 3.41)

- Q. 9** Differentiate the following (Write yours answer in 2 - 3 lines)

- correlation and rank correlation
- skewness and kurtosis
- Type-I and Type-II Errors
- Mean Deviation and Quartile Deviation
- Least significant Difference test and Tukey's Test.

- Q.10 a)** Write a short note on Testing of Hypothesis. Give various Steps to test a hypothesis.

- b)** What are Multiple Range tests? Explain LSD and DMRT tests along with procedure.