Exam Roll No.....

Tribhuvan University
Institute of Science and Technology
2083
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Bachelor Level / Second Year/ Third Semester/ Science
Computer Science and Information Technology (STA 215)
(Statistics II)
(NEW COURSE)

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Candidates are required to give their answers in their own words as for as practicable. All notations have the usual meanings. The figures in the margin indicate full marks.

Group A

Attempt any TWO questions. **(2×10=20)**

1. The following table presents measurements of mean noise levels in dBA (y), a roadway with in m (x_1) and vehicles mean speed in km/h (x_2) for 8 locations in Kathmandu.

y	78	78	80	81	79	82	83	77
X_1	6	8	10	9	11	7	6	8
X_2	40	42	53	57	52	50	40	45

   a) Develop a multiple regression equation to predict the mean noise levels using roadway width and mean speed as predictors.
   b) Estimate the mean noise levels for a location roadway width 12 m and vehicles mean speed is 54 km/h.
   c) Interpret the values of regression coefficients.
   d) Compute coefficient of multiple determination and interpret its value.

2. A laboratory technician measures the breaking strength of each 4 kinds of linen thread by means of 4 different instruments, and obtains the following results (in ounces):

Thread	Measuring instrument			
	I_1	I_2	I_3	I_4
T_1	21	22	20	22
T_2	25	27	27	24
T_3	25	22	24	26
T_4	20	21	23	21

   Looking upon the threads as treatments and the instruments as blocks, perform an analysis of variance at 5% level of significance.

3. An experiment was performed to compare the abrasive wear of two different laminated materials. Fifty pieces of material 1 were tested by exposing each piece to a machine measuring wear. Sixty pieces of material 2 were similarly tested. In each case, the depth of wear was observed. The sample of material 1 gave an average wear of 84.4 units with a sample standard deviation of 3.5, while the sample of material 2 gave an average of 80.2 with sample standard deviation of 2.7. Can we conclude at 1% level of significance that average abrasive wear of material 1 is more than that of material 2?

Group B

Attempt any EIGHT questions. **(8×5=40)**

4. What do you understand by design of experiment? Define briefly basic principles of a good experimental design.

5. A population consists of the four numbers 3,7,10 and 12. (i) Write down all possible samples of size 2 which can be drawn without replacement from this population. (ii) Find the mean of sampling distribution of sample means and also show that it is equal to the population mean. (iii) Find the standard error of sample mean.

6. Define confidence level in estimation. A random sample of 200 items is taken from a large batch of articles. The sample contains 12 defective items. Set up 98% confidence limits for the proportion of defective items in the batch.

7. A physical model suggests that the mean temperature increase in the water used as coolant in a compressor should not be more than 5^0 C. Temperature increase in the coolant measured on 7 independent runs of compressing unit revealed the following data: 5.1, 6.4, 5.9, 6.5, 4.9, 5.7 and 4.3. Do data contradict the assertion of physical model? Test at 5% level of significance.

8. Define central limit theorem. Suppose that the population of the gripping strengths of industrial workers is known to have a mean of 112 and standard deviation 11. For a random sample of 80 workers, what is the probability that the sample mean gripping strength will be greater than 114?

9. Consider an experiment with 4 groups, with 8 values in each. For the ANOVA summary table below, fill in all the missing results:

Source of Variation	Sum of square	Degree of freedom	Mean sum of square	F -value
Among Groups	?	?	80	?
Within Groups	560	?	?	
Total	?	?		

Also, test significance of difference between mean of 4 groups at 5% level of significance.

10. A large corporation is interested in determining whether a relationship exists between the commuting time of its employees and the level of stress – related problems on the job. A study of 126 workers reveals the following:

Commuting time	Stress level			
	High	Moderate	Low	Total
Under 20 min.	10	6	18	34
20—45 min	18	9	30	57
Over 45 min	20	7	8	35
Total	48	22	56	126

At 0.05 level of significance, is there evidence of a significance relationship between commuting time and stress level?

11. Define stochastic process. In a location each day is either sunny or rainy. A sunny day is followed by another sunny day with probability 0.8; whereas a rainy day is followed by sunny day with probability 0.4. It rains on Sunday. Make forecast for Monday and Tuesday.

12. Write short notes on:
    a) Importance of statistics on Information and Technology field.
    b) Difference between Parametric and Non parametric test.