Exam Roll No.....

Tribhuvan University
Institute of Science and Technology
2082
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Bachelor Level / Second Year/ Third Semester/ Science
Computer Science and Information Technology (STA 210)
(Statistics II)
(OLD 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. An experiment was conducted to determine if the weight of an animal can be predicted after a given period of time on the basis of the initial weight of the animal and the amount of the feed that was eaten. The following data, measured in kilograms, were recorded.

Final weight (y)	84	92	80	50	70	97	100	81
Initial weight (x_1)	35	40	41	32	36	39	44	35
Feed weight (x_2)	234	230	236	173	183	300	290	260

i) Fit a multiple regression equation.

ii) Predict the final weight of an animal having an initial weight of 38 kilograms and that is given 240 kilograms of feed.

iii) Compute coefficient of multiple determination and interpret its value.

iv) Compute standard error of estimate.

2. What are the basic principles of experimental designs? Set up the analysis of variance for the following results of a Latin Square Design.

A 12	C 20	B 10	D 13
C 17	B 12	D 9	A 18
B 22	D 10	A 10	C 21
D 11	A 12	C 17	B12

3. What do you understand by testing of hypothesis? The daily yield for a local chemical plant has averaged 880 tons for the last several years. The quality control manager would like to know whether this average has changed in recent months. She randomly selects from computer database and computes the average and the standard deviation of the n = 60 yields as mean = 872 tons and s.d. = 24tons, respectively. Test the appropriate hypothesis using $\alpha = .05$.

Group B

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

4. The following ANOVA summary table was obtained from a multiple regression model with two independent variables.

Source of Variation	Sum of square	Degree of freedom	Mean sum of square	F -value
Regression	180	?	?	?
Error	?	?	?	
Total	250	14		

i) Fill in the blanks in the above ANOVA table.

ii) Test the significance of the overall regression model at 5% level of significance.

5. The following arrangements indicate whether 30 consecutive cars which went by the toll booth of a bridge had local plates L or out of states plates O:

LL LOLLLOOOLLOOLOOLOLLLOLLLOO LL.

Test at 5% level of significance whether these arrangements of L's and O's may be regarded as random.

6. Define point and interval estimation. The mass of vitamin E in a capsule manufactured by a certain drug company is normally distributed with standard deviation 0.04 mg. A random sample of 100 capsules was analyzed and the mean mass of vitamin E was found to be 5.14 mg. Calculate (i) standard error of mean (ii) 95% confidence interval for the population mean mass of vitamin E per capsule.

7. The following are the average weekly losses of worker- hours due to accidents in 8 industrial plants before and after a certain safety program were put into operation:

Before	72	48	124	35	57	83	34	28
After	61	44	119	35	51	77	40	24

Use the 0.05 level of significance to test whether the safety program is effective or not.

8. The following data come from a study in which random samples of the employees of three government agencies were asked the questions about their pension plan.

	Agency 1	Agency 2	Agency 3
For the pension plan	60	85	100
Against the pension plan	40	55	30

Use 1% level of significance to test the null hypothesis that the actual proportions of employees favoring the pension plan are the same.

9. Define partial correlation with an example. From the data relating to yield of dry bark (x_1), height (x_2), and girth (x_3) for 20 Cinchona plants the following correlation coefficients were obtained: $r_{12} = 0.75$, $r_{13} = 0.80$,and $r_{23} = 0.50$. Find (i) the partial correlation between yield of dry bark and girth keeping height constant. (ii) The multiple correlation coefficient assuming yield of dry bark as the dependent variable.

10. Define Markov chain and describe its characteristics.

11. What are the basic concepts of queuing theory? Customers arrive at a shop at the rate of 2 per minute. Find (i) expected number of customers in a 5 minute period (ii) variance of the number of customers in a 5 minute period?

12. Write short note on :(i) Determination of sample size. (ii) Assumptions required for regression analysis.