

TRIBHUVAN UNIVERSITY

2081(Regular)

Bachelor Level (4 Yrs.) / Science & Tech. / II Year

Applied Statistics

Full Marks: 50

Time: 2 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

GROUP "A"

Attempt any SIX Questions.

6×5=30

1. What are the properties of good average? A system manager in charge of a company's network keeps the track of the number of server failures that occur in a day. Determine mean, median, mode, standard deviation, variance and coefficient of variation for the following data, which represent the number of server failures for the last 10 days: 3, 2, 0, 2, 5, 2, 2, 3, 1 and 4.
2. Define probability and explain the importance of this concept in statistics. A lavatory blood test is 98% effective in detecting a certain disease when it is, in fact, present. However the test also yields a "false positive" result for 1% of the healthy person tested. (That is, if a healthy person is tested, then, with probability 0.01, the test result will imply he or she has the disease). If 0.5% of the population actually has disease, what is the probability a person has the disease given that the test result is positive?
3. Define random variable with a suitable example. The lifetime of interactive computer chips produced by certain semiconductor manufacturer is normally distributed with mean = 1.4×10^6 hours and standard deviation = 3×10^5 hours. What is the probability that a chip randomly selected will have lifetime less than 1.8×10^6 hours?

4. Define confidence level in estimation. A quality control inspector collected a random sample of 400 tubes of toothpaste from the production line and found that 20 of the tubes had leakage. Construct 95% confidence interval for the percentage of all the toothpaste tubes that had leakage.
5. In study of 100 subjects with acute ankle sprains were tested to compare two treatment methods, one (called treatment) with oxygen at 1.2 atmosphere absolute pressure and the other (called Control) with air at 1.9 atmosphere absolute pressure in hyperbaric chamber. The subjects were divided equally in a double-blind manner between the two methods of treatment. A seven points Ankle Function Score (AFS) was tested to evaluate the effectiveness of each method and higher AFS indicates higher level of recovery. At the end the following information was gathered.

	Control	Treatment
Number of Subject	50	50
Mean AFS	5.2	6.3
Standard deviation of AFS	0.7	0.4

Using 5% level of significance, test whether Treatment is better than Control.

6. Define Type I and Type II error in testing of hypothesis. In a major health study, the researcher wanted to investigate how hospital mortality of new born babies varied over maternal drinking habit during pregnancy. The data base in the following was obtained from a random sample of 100 cases.

Did mother drink regularly?	Status of new born baby	
	Died	Survived
No	5	27
Yes	32	36

Does the study indicate that a newborn's survival depends on the mother's drinking habit? Draw your conclusion at 1% level of significance.

7. When are two attributes said to be positively associated and negatively associated? For two attributes A and B, we have $(AB) = 75$, $(A) = 80$, $(\alpha \beta) = 42$ and $N = 145$. Calculate the coefficient of association and interpret the results.

GROUP "B"

Attempt any TWO Questions.

$2 \times 10 = 20$

8. Pears for market are classified by weight in ounces. A farmer takes a random sample of latest harvest and observes the following distribution.

Weight	0.2-0.30	0.31- 0.40	0.41 - 0.50	0.51 - 0.60	0.61 - 0.70
Frequency	30	46	24	14	6

- i. Draw a histogram and frequency polygon.
 - ii. Compute the skewness of the distribution and interpret its value.
 - iii. What percentage of pears weigh more than 0.45 ounces?
9. Define positive and negative correlation. A phone company executive is studying the relationship between the number of telephone calls per week and the number of people in the household. A sample of 10 families is obtained:

Family	5	6	5	4	8	6	7	5	6	8
Calls	24	20	24	35	72	26	64	22	23	70

- i. Find correlation coefficient between family size and number of calls. Interpret the result.
- ii. Find the linear regression equation of number of calls on family size.
- iii. Estimate the number of calls for a family whose size is 9.
- iv. Compute standard error of estimate.

10. A pharmaceutical company has developed a new drug to combat hyper tension. As a study of the new drug's possible side effects the company researchers want to determine how the new drug changes body temperature. Eight patients suffering from hypertension are randomly selected and the body temperature (in $^{\circ}\text{F}$) of each is measured. The patients are then given drug, and after, 40 minutes the body temperature of each is measured again. The observed values of before and after drug, body temperature are given in the table:

Patient	1	2	3	4	5	6	7	8
Temperature before drug	97.8	99.3	97.9	100.4	98.1	98.5	99.0	101.2
Temperature after drug	97.0	98.5	98.1	98.6	98.1	98.1	99.4	99.6

At 5% level of significance, is there enough evidence to conclude that the new drug changes body temperature?

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