

Tribhuvan University  
Institute of Science and Technology  
2081



Bachelor Level / First Year/ Second Semester/ Science  
Computer Science and Information Technology (STA. 164)  
(Statistics I)  
**OLD COURSE**

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

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

### Section A

**Long answer questions.**

Attempt any **TWO** questions.

(2×10=20)

- What do you understand by the terms central tendency and dispersions? What are the different measures of central tendency? To study how first -grade students utilize their time when assigned a math task; a researcher observes 12 students and records their times off task out of 15 minutes. Time off task: 12, 6, 4, 0, 9, 7, 10, 7, 5, 8, 7 and 1. For this data set, find (i) Mean and Median. (ii) Range and Standard deviation.
- Differentiate between correlation and regression analysis. What are the required assumptions for correlation analysis? In one stage of development of a new drug for an allergy, an experiment is conducted to study how different dosages of the drug affect the duration of relief from the allergic symptoms. Eight patients are included in the experiment. Each patient receives a specified dosage of the drug and is asked to report back as soon as the protection of the drug seems to wear off. The observations are recorded in the table given below, which shows the dosage (x) and the duration of the relief (y) for 8 patients.

Dosage(x)	11	10	10	7	8	6	4	5
Duration of relief(y)	23	25	19	22	20	16	10	12

- Find the relationship between x and y. Interpret the result.
  - Find the regression equation of y on x.
  - Estimate the value of y when x= 11.
  - Interpret the value of the slope of the line.
- Define normal distribution. The scores of students in examinations are normally distributed with mean =74 and standard deviation = 6.5. Suppose that the instructor decides to assign letter grades to the following scheme:

Scores	Less than 40	40-60	60-80	80 and above
Grade	B <sup>-</sup>	B <sup>+</sup>	A <sup>-</sup>	A <sup>+</sup>

- Find the percentage of students in grade A<sup>+</sup>.
- Find the lowest score of the top 10% students.

### Section B

**Short answer questions.**Attempt any **EIGHT** questions.

(8×5=40)

4. What is sampling? Discuss stratified random sampling and snowball sampling.
5. What do you understand by skewness? Apples for market are classified by weight in gram. A farmer takes a random sample of latest harvest and observes the following distribution.

Weight	85	90	95	100
frequency	2	4	8	6

Compute the Karl Pearson's coefficient of skewness and interpret its value.

6. Define mutually exclusive events and independent events in probability with a suitable example. Engineers use the term "reliability" as an alternative name for the probability that the device does not fail. Suppose a mechanical system consists of two components that function independently. From the extensive testing, it is known that component 1 has reliability 0.90 and component 2 has reliability 0.95. If functioning of any one of component is sufficient for this system to function, what is the reliability of the system?
7. Define conditional probability. A group of executives is classified according to status of body weight and incidence of hypertension. The proportions of various categories appear in the table given below.

	Overweight	Normal weight	Underweight	Total
Hypertensive	0.11	0.10	0.04	0.25
Not hypertensive	0.15	0.40	0.20	0.75
Total	0.26	0.50	0.24	1.00

(i) What is the probability that a person selected at random from this group will have hypertensive? (ii) A person, selected at random from this group is found to be overweight, what is the probability that this person is hypertensive? (iii) A person, selected at random from this group is found to be hypertensive, what is the probability that this person is overweight?

8. Define mathematical expectation. The discrete random variable X has the following probability distribution.

X	9. 0	10. 1	11. 2	12. 3	13. 4
P(X)	14. 0.12	15. 0.25	16. 0.35	17. 0.18	18. 0.10

Find (i)  $P(0 < X < 3)$  (ii)  $E(X)$  (iii)  $E(X^2 + 3X)$ .

9. Under what conditions the binomial probability distribution is used? The phone lines to an airline reservation system are occupied 60% of time. Assume that the events that the lines are occupied on successive calls are independent. Assume that 10 calls are placed to the airline.

(i) What is the probability that exactly 4 calls the lines are occupied?

(ii) What is the probability that for at least one call the lines are occupied?

10. Under what conditions Binomial distribution tends to Poisson distribution? Fit a Poisson distribution to the following data :

No. of cells	0	1	2	3	4	5	Total
Frequency	200	131	42	18	8	1	400

11. An aptitude test was conducted by a college to all new entering students in science and management. Let the X and Y denote the proportions of correct answers a student get on the two tests respectively and the joint density function of the random variables X and Y is

$$f(X, Y) = k(2x + 3y); \quad 0 < x < 1, \quad 0 < y < 1 \\ = 0 \quad \text{otherwise.}$$

Find (i) the value of constant k (ii)  $P(x < 0.5, y < 0.5)$ .

12. Define moments. The first four moments about of distribution about the value 4 are 1, 4, 10 and 45. Find mean, variance, skewness and kurtosis and interpret the result.
13. Write short notes on any two:
- (i) Five number summary (ii) Interval scale and Ratio scale (iii) Role of computer in statistical analysis.