

**NEPAL COLLEGE OF INFORMATION TECHNOLOGY**  
**Assessment\_Fall\_2023**

Level: Bachelor  
 Programme: BE  
 Course: Probability and Statistics  
 Semester \_ III

Year: 2024  
 Full Marks: 100  
 Pass Marks: 45  
 Time: 3 hours

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

*The figures in the margin indicate full marks.*

**Attempts all the questions:**

1. a) Using Sturge's formula, construct exclusive type frequency distribution from the following data 7

62	68	69	80	68	79	83	70	74	73
74	75	80	77	80	83	73	79	100	93
92	101	87	96	99	94	102	95	90	98
86	93	91	90	95	97	87	89	100	93
92	98	101	97	102	91	87	110	106	118

Also draw a histogram and locate the mode.

- b) The scores of two batsmen A and B in ten innings during a certain match – series are as given below:

A	32	28	47	63	71	39	10
B	19	31	48	53	61	90	10

- i. Who is better run scorer?
  - ii. Who is the two batsmen is more consisting in scoring?
2. a) The following are the incomes (in thousands of rupees) for a

sample of 12 households.

23   17   32   60   22   52   29   38   42   92   27   46   7

Construct a box-and-whisker plot for these data. And describe the information obtained.

- b) Define the mathematical definition of probability. From a group of 3 engineers, 4 economists and 5 statisticians, a sub-group of 4 persons are selected at random from the group. 8

Find the probability that the sub-group will consist of

- i. 2 engineers and 2 economists
- ii. 1 engineer, 1 economist and 2 statisticians
- iii. All statisticians.

3. a) State Bayes theorem. In a bolt factory, Machine A, B and C manufacture respectively 25%, 35% and 40% of the total production. Out of their total, 5%, 4% and 2% are defective bolts respectively. A bolt is drawn at random from the total production and is found to be defective. What is the probability that it was manufactured by machine B? 7

- b) In a certain factory turning out optical lenses, there is a small chance  $1/500$  for any lens to be defective. The lenses are supplied in a packet of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective, one defective, two defective and three defective lenses respectively in a consignment of 10,000 packets. 8

4. a) In a class quiz, 8% of the students obtained marks below 25 and 90% of the students got below 85 marks. Assuming that 7

the marks are normally distributed, find the mean and standard deviation of the distribution.

- b) Let  $X$  and  $Y$  be two continuous random variables with joint probability density function

$$f(x, y) = Axy; \quad 0 < x < 1 \text{ and } 0 < y < x$$

- i. Find the constant  $A$ .
- ii. Find the marginal density functions of  $X$  and  $Y$ .
- iii. Find the conditional density function of  $Y$  given  $X = x$ .
- iv. Check the independency of  $X$  and  $Y$ .

5. a) A random sample of 10 students had the following I.Q's: 70, 120, 110, 101, 83, 88, 95, 98, 107, and 100. Find the 95% confidence interval for the mean I.Q values lie.

- b) Define level of significance. A manufacturer of transistors claims that the defective pieces cannot be 10% in any lot. A sample of 60 transistors was drawn randomly. On testing it was found that 7 transistors were out of order. Test whether the manufacturer's claim is correct. Use  $\alpha = 0.01$

6. a) The incomes (in Rs. 00) of the random sample of 6 engineers in industry I are 630, 650, 680, 690, 710, and 720 per month. The incomes of the similar random sample of 9 engineers in industry II are 610, 620, 650, 660, 690, 700, 710, 720 and 730 per month. Test the hypothesis that industry I pay its engineers much better



than industry II.

- b) The following data gives the experience of machine operators in years and their performance as given by the number of good parts turned out per 100 pieces.

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Operator	1	2	3	4	5	6	7	8
Experience	15	14	18	5	3	10	7	13
Performance	88	89	90	78	68	75	83	87

- Find the correlation coefficient between experience and performance of the operators.
  - Estimate the performance of an operator who has 10 years of experience.
  - Also find the standard error of estimate.
7. Write short notes on any **TWO**: [2\*5 =10]
- Errors in hypothesis testing.
  - Different approaches of probability.
  - Criteria for good estimator.