

Subject: - Probability and Statistics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) The following data represents the tensile strength of steel rods manufactured by company A in Biratnagar. [8]

65	36	49	84	79
43	67	36	43	78
68	72	70	55	62
50	60	56	57	46
22	65	59	48	76
69	51	40	56	45

Construct a frequency distribution with class difference of 5 and draw ogive curve. Also, find out the median value of the distribution.

- b) The following table explains the distribution of income of certain workers in a company. [7]

Income(000)	Frequency
0-20	5
20-40	16
40-60	13
60-80	7
80-100	5
100-120	4

- i. What is the average income expenditure of the workers?  
ii. Find standard deviation of the workers.

2. a) Define mutually exclusive events. A class contains 10 people out of which 2 are Indian, 3 are Pakistani and 5 are Nepali. 3 peoples are drawn at random. What is the probability that [3]

- i. Three are of different nationality.  
ii. The balls are of the same nationality.

- b) The average number of accidents in a year attributed to a taxi driver in a city is 3. Out of 1000 taxi drivers, find approximately the number of taxi drivers with [7]

- i. More than 3 accidents in a year  
ii. At least 4 accidents in a year

3. a) The Following table presents a discrete probability distribution associated with the daily demand of a product. [7]

Number of demands per day (X)	10	20	30	40	50	Total
Probability/ P(X)	0.08	k	0.28	0.3	0.1	1

- i. Find value of k  
ii. Determine the mean daily demand  
iii. What is the standard deviation of daily demand?

- b) In an examination 15% of the students got first class (marks above 60) and while 40% failed (marks below 40). Assuming the marks to be normally distributed, estimate the mean and standard deviation. Also find its' coefficient of variation. [8]

4. a) Suppose that  $X$  is a random variable, whose probability density function is given by, [8]
- $$f(x) = C(4x - 2y^2), 0 < x < 2, 0 < y < 1$$
- i) Determine the value of  $C$ .
  - ii) Determine the cumulative Probability of  $X$ .
  - iii) Find the Marginal density function of  $X$  and  $Y$ .
  - iv) Find the conditional density function of  $X$  given  $Y=y$ .

- b) Define Estimation. A hotel manager in Kathmandu wants to know the hotels average daily registration. The following table presents the number of guests registered for 14 randomly selected days. Calculate the sample mean, standard error, and 95% confidence interval of the population mean. [7]

61	57	60	57	54	58	55
52	65	40	64	70	22	56

5. a) Define A medical test is conducted in a School to test the association between COVID-19 and gender. After completion of the medical test following information was observed.

Gender	Absence of Covid 19	Presence of Covid 19
Male	40	65
Female	55	30

Test the purpose of the medical test tournament at a 5% level of significance. [7]

- b) Define the degree of freedom. A class test was carried out among 25 students using 5 different sets of questions and the marks secured were as follows. Test whether the set of questions is of the same standard or not at a 5% level of significance. [8]

Questions Set				
A	B	C	D	E
12	10	14	13	12
14	17	11	11	14
18	15	13	15	12
17	16	10	13	15
14		15	14	
19		12		

6. a) In cold storage, 1000 apples were kept under one type of storage among them 4% were found to be rotten. 1500 apples were kept under another storage and among them 3% were found to be rotten. Test that the first type of storage is superior to the second type of storage.

- b) The Following table consists of the Age and Weight of students in a class. [7] [8]

Age (in Years) (X)	17	18	22	25	24	16	15	21	27	19
Weight (in Kgs) (Y)	45	40	35	44	50	25	35	40	55	32

Find

- a) Correlation between Age and Weight of students.
- b) Regression equation of  $Y$  on  $X$ .
- c) Obtain Coefficient of Determination
- d) Interpret intercept term, slope and coefficient of Determination.

7. Write short notes on (any two)

- a) Probability and Non- Probability Sampling [2\*10=10]
- b) Differentiate between Cluster Sampling and Stratified Sampling Methods.
- c) Define Type I and Type II errors in Hypothesis Testing.



Pokhara University  
Everest Engineering College  
Final Assessment  
Semester - Fall

**Level:** Bachelor

**Program:** BE CMP , 5th Semester

**Faculty:** Science and Technology

**Subject:** Probability & Statistics (New)

**Year:** 2025

**F.M:** 100

**P.M:** 45

**Time:** 3 hrs.

*Attempt all the questions.*

1. (a) Given below the pre-tax monthly income (in rupees) of the workers of FEWA hydropower in 2000.

Income More than ('000' Rs )	7	6	5	4	3	2	1	0
No. of workers	2	8	10	15	25	40	55	60

Draw less than ogive curve and find out,

- The highest income of the lowest 50% of the workers.
- The highest income of the lowest 30% of the workers.
- The income limits of middle 40% of the workers.
- The minimum income earned by the top 5% of the workers.

[8]

- (b) State Baye's Theorem. A first step towards identifying spam is to create a list of words that are most likely to appear in the spam than in normal messages. Suppose a specified list of words is available and that your data base of 5000 messages contains 1700 that are spam. Among the spam messages, 1343 contains words in the list. Of the 3300 normal messages, only 297 contains words in the

list.

- Find the probability that a random message contains the words in the list.
- Find the conditional probability that a message is spam given that the message contains words in the list. [7]

2. (a) A r.v. X has following probability mass function.

X	2	3	4	5	6	7
P(x)	0.1	k	0.2	2k	0.3	k

- (i) Find the value of k. (ii) Construct the cumulative distribution function  $F(x)$ . (iii)  $P(X \geq 3/X < 5)$  (iv) Find  $E(X)$ ,  $E(2X+1)$ ,  $E(4x - 3)^2$ ,  $V(X)$  and  $V(2X+1)$ . [8]

- (b) The mean  $np$  and variance  $npq$  of binomial distribution are 3 and 2 respectively. Find the probability that the variate takes values (i) less than or equal to 2 (b) greater than or equal to 7. [7]

- (c) (a) In a certain city, the daily consumption of electric power (in millions of kilowatt hours) can be treated as a random variable having a gamma distribution with parameter  $\alpha = 3$ ,  $\beta = A$ . If the power plant of this city has a daily capacity of 12 millions kilowatt hours, what is the mean of this gamma distribution. What is the probability that this power supply will be inadequate on any given day? [7]

- (b) In an examination, 30% of the candidates obtained marks

below 40 and 35% of candidates obtained between 40 and 70 marks. Assuming that the marks are normally distributed, find the mean and standard deviation of the distribution? Also, find the probability that a selected candidate will obtain the marks more than 80 ? [8]

4. (a) Suppose that the random variables  $X$  and  $Y$  have the joint pdf

$$f(x, y) = \begin{cases} k(6 - x - y) & \text{if } 0 < x < 2, \quad 2 < y < 4 \\ 0 & \text{if otherwise} \end{cases}$$

- i. Evaluate the constant  $k$ .
- ii. find the marginal probability density function of  $X$  and  $Y$ .
- iii. Find the conditional probability distribution of  $Y$  given  $X = x$ .
- iv. Find  $P(X + Y < 3)$  and  $P(X < 1/Y < 3)$
- v. Are  $X$  and  $Y$  independent? [8]

- (b) A random sample of 500 bulbs was taken from the manufacturing company among them, 65 were found to be defective. Construct 99% confidence interval for the population proportion of defectiveness. Also, estimate the standard error of the proportion. [7]

5. (a) What are the characteristics of good estimator? A random sample of 8 envelopes is taken from letter box of a

post office and their weights in grams are found to be 12.1, 11.9, 12.3, 11.5, 11.9, 12.1, 12.4, 12.1. Find 99 % fiducial limits (confidence interval) for the mean weigh of envelops received at that post office. [7]

- (b) What is critical value?. A machine puts out 15 imperfect articles in a sample of 400. After machine is overhauled, it puts out 2 imperfect articles in a batch of 80. Has the machine improved? Test the hypothesis if the probability of committing type I error be 0.05 ( That is, level of significance  $\alpha = 5\% = 0.05$ ). [8]

6. (a) An experiment was run to determine the effect of a new type drug on blood pressure. 10 persons have their blood pressure measured before and after the drug is given, The result of the experiment are as follows:

Persons	1	2	3	4	5	6	7	8	9	10
Before	116	118	120	124	128	130	131	134	136	137
After	119	124	126	128	121	135	137	138	139	135

Test the hypothesis that new drug raise blood pressure at  $\alpha = 5\%$ . [7]

(OR)

In an experiment to study the dependence of hypertension and smoking habits, the following data were taken on 180 individuals.

Cases	Non smokers	Moderate smokers	Heavy smokers
Hypertension	21	36	30
No Hypertension	48	26	19

Test the hypothesis that presence or absence of hypertension is independent of smoking habits at 5% level of significance? [7]

- (b) The following table presents shear strengths(in kN/mm) and weld diameters (in mm) for a sample of spot welds.

Diameter	4.2	4.4	4.6	4.8	5.0	5.2	5.4
Strength	51	54	69	81	75	79	89

- i. Find correlation coefficient and then test whether it is significant or not. Also, compute the coefficient of determination and interpret the result.
- ii. Compute the least square regression line for predicting strength from diameter and then predict the strength for a diameter of 5.5 mm. Also, compute standard error of estimate. [8]

7. Write short notes on : (Any Two)

- (a) Central limit Theorem
- (b) Probability and Non probability sampling
- (c) Types of error in hypothesis testing [2 × 5 = 10]

Attempt All Questions.

1. a) Over a period of 40 days the percentage relative humidity in a vegetable storage building was measured. Mean daily values were recorded as shown below:

60	63	64	71	67	73	79	80	83	81
86	90	96	98	98	99	89	80	77	78
71	89	74	84	85	82	90	78	79	79
78	80	82	83	86	81	80	76	66	74

- i) Prepare a stem and leaf display for these data. Show the leaves sorted in order of increasing magnitude of each stem.  
ii) Draw a box plot for these data. .... (8)

From the following distribution of marks of 500 students of a college, find the minimum pass marks, if only the 20% of the students had failed and also the minimum marks obtain by top 25% of the students. (7)

Marks	0-20	20-40	40-50	50-60	60-80	80-100
No. of Students	50	100	150	90	60	50

- a) How you define conditional probability. It is known that 25% of the males and 10% females are unmarried in a certain part of the city consisting of equal number of male and female. A person is selected at random and found to be unmarried. What is the probability that i) he is male ii) she is female.  
b) A coin is tossed until a head appears. What is the expectation of number of tosses required?  
3. a) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. (8)

OR

In a certain city, the daily consumption of electric power (in millions of kilowatt-hours) can be treated as a random variable having a gamma distribution with  $\alpha = 3$  and  $\beta = 2$ . If the power plant of this city has a daily capacity of 12 million kilowatt hours. What is the probability that this power supply will be inadequate on any given day?

b) The quality control manager at a light bulb factory needs to estimate the mean of large shipment of life bulbs. The process standard deviation is known to be 100 hrs. A random sample of 64 light bulbs indicated a sample mean life of 350 hrs.

i) Find the standard error of the mean and interpret its meaning

ii) Set up 95% confidence interval of the true population mean life of bulbs in this shipment

iii) Do you think that manufacturer has the right to state the light bulbs last an average of 390 hrs?

4 a) In a continuous distribution whose p.d.f. is given by  $f(x) = Ax(2-x)$   $0 \leq x \leq 2$  i) Find the value of A and b) Prove that the distribution is symmetrical. (7)

b) Two random variables X and Y have the following probability density function

$$f(x,y) = K(4-x-y) \quad 0 < x < 2 \quad 0 < y < 2$$

$$= 0 \quad \text{otherwise.}$$

I) Find the constant K

II) marginal density function of X and Y. III) Conditional Probability density function of X and Y (8)

5) a) A random sample of 8 envelopes is taken from letter box of post office and their weights in gms are found to be 12.1, 11.9, 12.3, 11.9, 12.1, 12.4, 12.1, and 11.5. Find 99% fiducial limits for the mean weight of envelopes received at the post office. ....(8)

b) What do you mean by p-value? In a factory 2% fans were found to be defectives in a lot of 3000 fans and in other factory 3% fans were found to be defective in a lot of 2500 fans. Do you find that the fans in second factory are significantly inferior compared to the fans in the first factory? (Use  $\alpha=5\%$ )(7)

6. a) An experiment was run to determine the effect of new type drug on blood pressure. Ten persons have their blood pressured measured before and after of the drug is given. The results of experiments are as follows:

Persons	1	2	3	4	5	6	7	8	9	10
Before	116	118	120	124	128	130	131	134	136	137
After	119	124	126	128	121	135	137	138	139	135

Test the hypothesis that new drug raise blood pressure at  $\alpha=0.05$ . ....(8)

b) the given table shows the heights in centimeter and the weight in kg of ten men:

Height	162	168	174	176	180	180	182	184	186	186
Weight	65	65	84	63	75	76	82	65	80	81

i) Construct the regression equation of weight on height.

ii) Find the coefficient of determination and interpret it. Also find standard error. (7)

7. Write short notes on (Any two) (2x5=10)

a) Error of hypothesis testing

b) Characteristics of good estimator c) Limitation of Statistics

**Madan Bhandari College of Engineering**  
**Internal Assessment**

<b>Level:Bachelor</b>	<b>Semester : Fall</b>	<b>Year:2024</b>
<b>Programme:BE</b>	<b>Time: 3hrs</b>	<b>Full Marks:100</b>
<b>Course: Probability and Statistics</b>		<b>Pass Marks: 45</b>

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

**Attempt all the questions:**

- 1 a) The following data set represents the number of new computer accounts registered during ten consecutive days.

43,37,50,51,58,105,52,45,45,10

- i. Compute the mean, median and standard deviation
- ii. Draw a box and whisker plot and identify whether it is skewed or not.

- b) After the implementation of an economic program to uplift the economic condition of a community following information were found

Monthly income (Rs.000)	4-6	6-8	8-10	10-12	12-14	14-16	16-18
After the plan(no. of families)	8	65	37	15	15	5	5

Construct an ogive to find

- i. Find the number of families whose monthly income is between Rs.8000 to Rs. 14000
- ii. Find the number of families whose monthly income is above Rs. 12000

- 2 a) A firm has 80% of its service calls made by a contractor and 10% of these calls result in customer complaints.

The other 20% of the service call are made by their own employees, and these calls have a 5% complaint rate. Find the probability of a complaint. Also, using Bayes theorem to find the probability that a complaint was

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8

7

from a customer whose service was provided by the contractor.

- b) Three bags contain 3 video cards and 2 network cards, 5 video cards and 6 network cards, 2 video cards and 4 network cards respectively. One card is drawn from each urn. Find the expected number of video cards.

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- 3 a) Message arrive at an electronic message center at random times, with an average of 9 messages per hour.

- i. What is the probability of receiving at least five messages during the next hour?
- ii. What is the probability of receiving exactly five messages during the next hour?

- b) The average diameter of a sample of 1000 pipes is 2.6 inches and standard deviation is 0.55. Assuming that the diameter of pipes is normally distributed. Find the number of pipes of diameter

5

- i. Greater than 2 inches.
- ii. Between 2 and 3.1 inches

- c) A continuous random variable X has the following density function.

$$f(x) = kx^2 \text{ for } 0 < x < 1 \\ = 0 \text{ otherwise}$$

5

- i. Find the value of k
- ii.  $P(0 < X < 0.7)$
- iii.  $E(X)$

- 4 a) In a random sample of 300 households in a city 223 have computer. Set an approximate 95% and 99% limits to the true value of proportion of households with computer in the whole city.

7

- b) A random sample of 200 bolts manufactured by machine A and of 100 bolts manufactured by machine B showed 19 and 5 defective bolts respectively. Test the hypothesis that machine B is performing better than A at 5% level of significance.

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- 5 a) The sales data of steel for a steel factory in six shops before and after a special promotional campaign are as under:

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Shops	A	B	C	D	E	F

Before campaign	53	28	31	48	50	42
After campaign	58	29	30	55	56	45

Can the campaign be judged to be a success? Test at 5% level of significance

- b) Describe the importance of sampling. Two types of drugs were used on 5 and 7 patients for reducing their weight. Drug A was imported and drug B indigenous. The decrease in the weight after using the drugs for six months was as follows: 8

Drug A	12	13	11	14	10		
Drug B	9	12	14	15	10	9	8

Is there a significant difference in the efficiency of two drugs?

- 6 a) Scraps of iron were selected on the basis of their densities, X and their iron contents Y were measured. 7  
The results were as follows:

X	2.8	2.9	3.0	3.1	3.2	3.2	3.2	3.3	3.4
Y	27	23	30	28	30	32	34	33	30

- i. Find the relationship between their densities ad their iron content
- ii. Find the regression equation of y on x.

- b) A Population consists of five members 2,3,6,8 and 11. 8
- i. Draw all possible sample of size 2 that can be drawn from the population without replacement.
  - ii. Find mean and variance of population
  - iii. Find the mean of sampling distribution of means and show that it is equal to the population mean.

- 7 Write short notes on :(Any two) (10)

- a) Sourve of data and its types.
- b) Normal distribution and its characteristics
- c) Criteria of good estimator.

# NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY

(Affiliated to Pokhara University)

Dhangadhi, Kailali

## Pre-University Examination

Level: Bachelor

Semester: V\_Fall

Year : 2024

Programme: B.E. Computer

F.M. : 100

Course: Probability and Statistics

P.M. : 45

Time : 3hrs.

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

Attempt all the questions.

1 a.) The weekly salaries of 84 workers in a factory are given below:

Salary	300-310	310-320	320-330	330-350	350-370	370-410
No. Of workers	8	12	28	18	16	10

Construct a histogram, frequency polygon and frequency curve.

[7]

b) The factories produces two types of a car batteries A and B. An experiment shows the life of batteries in days which were recorded as follows:

Life in days	50-70	70-90	90-110	110-130	130-150
Battery A	5	11	26	10	8
Battery B	4	30	12	8	6

Compare the variability of two types of batteries using coefficient of Variation.

21.636%      23.40%

[8]

2.a) State and prove Baye's theorem.

$$P(E_1 | A) = \frac{P(E_1) \cdot P(A|E_1)}{\sum_{i=1}^n P(E_i) \cdot P(A|E_i)}$$

[7]

OR

The contents of urns I, II and III are as follows:

1 white, 2 black and 3 red balls

2 white balls, 1 black and 1 red balls.

4 white, 5 black and 3 red balls.

One urn is chosen at random and two balls are drawn. They happen to be white and red. What is the probability that they come from urns II ?

b) A random variable X has the following probability mass function

X:	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2K	0.3	K

Find:

i. The value of K

6.1

- ii. Expected value of  $X$  0.8  
 iii. Standard deviation of  $X$  2.8 1.7698 [8]

3.a) If 5% of the electric bulbs manufactured by a company are defective, use poisson distribution to find the probability that in a sample of 100 bulbs,

[7]

- i) none is defective 0.00673
- ii) at least one is defective 0.99327
- iii) at most 2 bulbs are defective 0.1246
- iv) 5 bulbs are defective 0.175

b) In an examination 15% of the students got first class 60 marks above, while 40% securing below 40 marks. Assuming the marks are normally distributed, estimate mean and standard deviation.

[8]

$$\mu = 43.87, \sigma = 15.5$$

4.a) In a certain city, the daily consumption of electric power (In millions of Kilowatt-hours) can be treated as a random variable having a gamma distribution with  $\alpha=3$  and  $\beta=2$ . If the power plant of this city has a daily capacity of 12 million of kilowatt hours. What is the mean of this gamma distribution? What is the probability that this power supply will be inadequate on any given day?

[7]

b) The joint probability function of random variable  $X$  and  $Y$  is given by

$$f(x,y) = k(2x+y), \text{ for } 0 < x < 2, 0 < y < 3 \\ = 0, \text{ otherwise}$$

$$\frac{1}{21}$$

i) Find the marginal density of  $X$  and  $Y$ .

[8]

ii) Are  $X$  and  $Y$  independent or not?

5.a) A random sample of 10 boys had the following I.Q.'s 70, 120, 110, 101, 83, 88, 95, 98, 107 and 100. Find the reasonable range in which most of the mean I.Q. values of samples of 10 boys lie ( $\alpha=5\%$ )

[7]

b) A machine puts out 16 imperfect articles in a sample of 500. After machine is overhauled, it puts out 3 imperfect articles in a batch of 100. Has the machine improved? ( $\alpha=5\%$ )

[8]

6.a) An I.Q. test was administered to 5 persons before they were trained. The results are given below

Persons	1	2	3	4	5
IQ before training	110	120	123	132	125
IQ after training	120	118	125	136	121

Test whether there is any change in IQ after the training program.

[7]

b) The following are the heights in centimeter and weights in kilogram of 8 men:

Height	160	168	174	176	180	181	182	185
Weight	65	66	68	70	75	76	78	80

i) Develop the estimating regression equation of weight on height.

$$\hat{Y} = -10.35 + 0.24$$

ii) Estimate the weight of men whose height is 175cm.

$$Y = -10.35 + 0.24 \times 175$$

$$= 71.65$$

[5\*2=10]

7. Write short notes on (any two):

- a) Source of Data.
- b) Characteristics of normal distribution
- c) Criteria of good estimator

~~(N<sub>1</sub>) (N<sub>2</sub>)~~  
~~(N)~~

# Nepal College of Information Technology

## Assessment

Level: Bachelor

Semester: Fall

Year: 2024

Programme: BE-~~SE~~-~~IT~~

Full Marks: 100

Course: Probability and Statistics

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) The polythene bags are taken randomly from two manufacturing company's A and B; and are tested by a prospective buyer for bursting pressure. The results are as follows. It is generally assumed that the bags having more uniform pressure will have long lifetime. If the prices are same, which manufacturing company bags would be preferred by the buyer and why?

Bursting Pressure (in lbs.)	No. of Polythene bags	
	A	B
5 - 10	2	9
10 - 15	9	11
15 - 20	29	18
20 - 25	44	32
25 - 30	11	17
30 - 35	5	13

- b) State Bayes theorem. The probability that the person has a certain disease is 0.03. Medical diagnostic test is available to determine whether the person actually has the disease. If the disease actually present, the probability that the medical diagnostic test will give a positive result (indicating that disease is present) is 0.9. If the disease is not actually present, the probability of a positive test result (indicating that it is present) is 0.02. What is the probability that the disease is actually present given a positive result has occurred?

2. a) Define mathematical expectation of a discrete random variable. The probability distribution for the number of defective items ( $x$ ) is a sample of 4 is as follows:

X:	0	1	2	3	4
P(X):	0.35	0.39	0.19	0.06	0.01

Calculate the expected value, variance and standard deviation for  $x$ .

- b) Out of 1,000 families of 3 children each, how many families would you expect to have (i) two boys and 1 girl, (ii) no girls, assuming that boys and girls are equally likely?

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**OR**

The average number of network error experienced in a day on a local area network (LAN) is distributed with an average 2.4. What is the probability that in any given day:

- Zero network error will occur?
  - Exactly one network error will occur?
  - At least one network error will occur?
3. a) If the annual proportion of erroneous income tax returns field can be looked upon as a random variable having a beta distribution with  $\alpha = 2$  and  $\beta = 9$ , find
- the mean of the distribution and
  - the probability that in any given year there will be fewer than 10% erroneous tax returns.

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- b) Define standard normal variable. In a normal distribution, 31% of the items are under 45 and 8% are over 64. What are the mean and standard deviation of the distribution?
4. a) Define joint probability density function. If the joint probability density function of two continuous random variables is given by

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$$f(x, y) = \begin{cases} 6e^{-2x-3y}, & \text{for } x > 0, y > 0 \\ 0, & \text{elsewhere} \end{cases}$$

Find

- Marginal density function of X and Y.
  - Are X and Y independent?
- b) A population consists of 4 units A, B, C, and D with values 8, 2, 6, and 4.
- ✓ Construct a sampling distribution of sample mean by selecting samples of size 2 in random sampling without replacement.
- Find the mean and variance of the sampling distribution of the sample mean
  - Also examine whether the sample mean is an unbiased estimator of population mean.
5. a) A random sample of 500 apples was taken from a large consignment and 60 were found to be bad. Obtain the 95% and 99% confidence limits for the percentage number of good apples in the consignment.

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**OR**

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) A potential buyer of light bulbs bought 50 bulbs of each of two brands upon testing these bulbs, he found that Brand A has a mean life of 1282 hours with a standard deviation of 80 hrs whereas B had a mean life of 1208 hrs with a standard deviation of 94 hrs can the buyers be quite certain that the two brands differ in quality?

8

- a) An experiment was run to determine the effectiveness of a new type of drug on blood pressure. Ten persons have their blood pressure measured before and after the drug is given. The result of the experiment are as follows:

7

Before	116	118	120	124	128	130	131	134	136	137
After	119	124	126	128	121	135	137	138	139	135

Test the hypothesis that new drug raises the blood pressure at  $\alpha = 0.05$ .

- b) Given the following data of CPU time required (Y) and the number of disk I/O operations (X).

8

Time in sec. (Y)	24	38	42	50	60	30	20	25	40	39
Number (X)	398	390	410	502	590	305	210	252	398	392

- i. Compute the coefficient of correlation between X and Y.
- ii. Estimate the CPU time requirement for 550 disk I/O operations.
- iii. Find coefficient of determination and interpretation.

Write short notes on any TWO:

$$2 \times 5 = 10 \times 5 =$$

- a) Primary data and Secondary data.
- b) Random variable
- c) Errors in hypothesis testing.

**NEPAL COLLEGE OF INFORMATION TECHNOLOGY**  
**Assessment Fall 2024**

Level: Bachelor  
 Programme: BE\_CE  
 Course: Probability and statistics  
 Semester: V

Year : 2025  
 Full Marks: 100  
 Pass Marks: 45  
 Time : 3 hrs.

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

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) An investigator wants to study the speed of cars and collected the speed of 30 vehicles

35	37	42	45	47	48	50	55	67	70
75	80	90	95	94	48	55	60	71	63
70	65	80	55	40	35	36	85	79	30

- i) present the above data in stem and leaf display
- ii) construct box and whisker plot
- iii) construct the continuous class interval
- iv) Find median speeds; find 25% and 75% speed of the vehicles.

b) A purchasing agent obtained samples of bulbs from two suppliers .He had the samples tested in his own laboratory for length of life with the following results

Length of life (hrs)	Sample from A	Sample from B
700-900	10	3
900-1100	16	42
1100-1300	26	12
1300-1500	8	3

- a) Which company's bulb gives a higher average life?
- b) Which company's bulbs are more uniform?

2. a) State Baye's theorem? In a class of 75 students, 15 students were considered to be intelligent, 45 as medium and rest below the average. The probability that a very intelligent student fails in examination is 0.005, the medium student failing has probability 0.05 and below the average is 0.15. If a student is known to have passed the examination, what is the probability that he is below the average?

b) An urn contains 7 red and 4 white balls, 3 balls are drawn at random, find the probability distribution of number of white balls drawn. Also find the mathematical expectation and variance of the distribution.

3. a) The number of accidents in a year attributed to taxi driver in a city is Poisson distribution with mean is 3. Out of 1000 taxi driver, find approximately the number of driver with

- i. more than 3 accidents in a year
- ii. atleast 1 accident

b) Suppose that the joint probability distribution of X and Y is given as

$$f(x,y) = 4xy; 0 < x < 1, 0 < y < 1$$

; 0 otherwise

- i. verify the probability density function
- ii. find marginal probability function of X and Y
- iii. find conditional probability function of X and Y
- iv. Are X and Y are independent.

4. a) In a statistics examination 15% of the candidates scored more than 63 marks and 10% of the candidates scored less than 32 marks. Assuming that the marks were distributed normally find the mean and standard deviation? Determine the  $P(20 < X < 80)$

b) A random sample of 12 values from a normal population showed a mean of 31.9 inches and sum of square of deviation from this mean is 125 inches. Obtain 95% and 99% confidence interval for population mean?

5. a) Memory capacity of 10 students was tested before and after training, state whether the training was effective or not at 5% level of significance.

Roll no: 1 2 3 4 5 6 7 8 9 10

Before training: 12 14 11 8 7 10 3 0 5 6

After training: 15 16 10 7 5 12 10 2 3 8

b) The coordinator in a college claimed that atleast 98% of the students submit their assignment on time. Taking the sample of 250 students, 15 were not submitting assignment in whole semester. Test his claim at 10% level of significance

6. a) The following data related to the number of children classified according to the type of feed and the nature of teeth.

Type of feed	Nature of teeth	
	normal	Defective
Breast	18	12
bottle	2	13

Do the information provide sufficient evidence to conclude that type of feeding and nature of teeth are dependence? Use chi square test at 5% level of significance

b) A panel of two Judges A and B graded 7 dramatic performance by independently awarding marks as follows

Marks A (x) 46 42 44 40 43 41 45

Marks B (y) 40 38 36 35 39 37 41

- i. Fit a straight line on  $y = a + bx$
- ii. Estimate the value of y when  $x=37$
- iii. Find standard error of estimate
- iv. Find the coefficient of determination

7. Write short notes on; (any two)

- a) Point and interval estimation
- b) Condition to apply binomial and poisson distribution
- c) Characteristics of Beta and gamma distribution

# Nepal Engineering College

Level: Bachelor

Semester: Fall Year: 2024

Program: Computer

Full Marks: 100

Course: Probability and Statistics (New)

Time: 3hrs.

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

The figures in the margin indicate full marks.

Attempt all the question

- 1 a) The mean and standard deviation of 20 items is found to be 10 and 2 respectively. At the time of checking it was found that one item 8 was incorrect. Calculate the mean and standard deviation if 8
    - i) the wrong item is omitted
    - ii) it is replaced by 12
  - b) Two set of candidates are competing for the positions on the board of directors of a company. The probability that the first and second sets will win are 0.6 and 0.4 respectively. If the first set wins the probability of introducing a new product is 0.90 of the corresponding probability. If the second set wins is 0.3. What is the probability that the products will be introduced? 7
  - 2 a) A dice is rolled until 2 appears. Find the expected number of rolls required. 8
  - (b) If chance of passing an examination of probability and statistics is 60%. If a randomly selected student has passed exam, what is the probability that it was his 5<sup>th</sup> attempt? 7
  - 3 a) Define gamma distribution. Derive its mean and variance. 8
  - b) In an examination, 10% of the students got less than 20 marks and 5% of the students got over 75 marks. Assuming the distribution to be normal, find the mean standard deviation of the distribution. 7
  - 4 a) Given the Joint PDF 8
$$f(x, y) = c(2 - y) \text{ for } 0 < x < 4 \text{ and } 0 < y < 1 \\ 0 ; \text{ otherwise}$$
    - (i) What is the value of c?
    - (ii) Find the marginal PDF of X, and the marginal PDF of Y
    - (iii) Are X and Y independent? Explain why or why not.
  - b) A population consists of the value 7, 6, 8, 4, 10. Prove that sample mean of size 3 is unbiased estimate of population mean. 7  
OR
- Define estimation and hypothesis testing. Discuss the criteria of good estimator.
- 5 a) A random sample of 10 bulbs have the following life in months: 24, 26, 32, 28, 20, 20, 23, 34, 30 and 43. Obtain 95% fiducially limit for the population mean. 8

b)

A random sample of nine students was selected to test for the effectiveness of a special course designed to improve memory. The following table gives the results of a memory test given to those students before and after this course. 7

Before	43	57	48	65	81	49	38	69	58
After	49	56	55	77	89	57	36	64	69

- 6 a) In a random sample of 600 and 1000 men selected from two cities - Birgunj and Bharatpur, 400 and 600 men were found to be literate. Do the data indicate at 1% level of significance that two cities are significantly different in the percentage of literacy? 8

OR

A consumer research organization selects several car models each year and evaluates their fuel efficiency. In this year's study of two similar subcompact models from two different automakers, the average gas mileage for 40 cars of brand A was 37.2 miles per gallon (mpg) and the standard deviation was 3.8 mpg. The 50 brand B cars that were tested average 32/mpg and the standard deviation was 4.3mpg. At  $\alpha = 0.01$  should it conclude that brand A cars have higher average gas mileage than that of brand B.

b)

The following data gives the number of twists required to break a certain type of forged alloy bar and percentage of alloying element A present in the metal. 7

No of twist	41	49	69	65	40	50	58	57	31	36
Percentage of element A	10	12	14	15	13	12	13	14	13	12

- a) Fit the regression equation of number of twists on percentage of element A. Determine the predicted number of twists required to break an alloy when percentage of element is 20.

b) Find correlation coefficient

c) Find coefficient of determination

7. Write Short note on (any two)  $2^*5 = 10$

a) Hypergeometric distribution

b) Errors in Hypothesis Testing

c) Expectation and variance of random variable

**POKHARA ENGINEERING COLLEGE**  
**Pokhara**

Level: Bachelor

Year : 2025

Programme: BE/Computer/IT

Full Marks: 100

Course: Probability and Statistics (New)

Pass Marks: 45

Time : 3hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) The factories produce two type of car batteries i.e. battery A and battery B. An experiment shows the life of batteries in days which were recorded as follows.

7

Life in days	500-700	700-900	900-1100	1100-1300	1300-1500
Battery A	5	11	26	10	8
Battery B	4	30	12	8	6

Compare the variability of two type of batteries using coefficient of variation.

3. a)  
b)

4. a)

b)

5. a)  
b)

- b) all producing springs of same length. Of their production, machine X, Y and Z produces 5%, 4% and 2% defective springs respectively. Of the total production of springs in the factory, machine X produces 25%, machine Y produces 35% and machine Z produces 40%. If one spring is selected at a random from the total springs produced in a day.

8

find:

i. The probability that it is defective.

ii. The conditional probability that it was produced by machine.

2. a) Random variable X has the following probability function:

7

X	-2	-1	0	1	2
P(x)	0.2	0.1	0.3	0.3	0.1

Find:

- i.  $E(X)$
- ii.  $E(2X-3)$
- iii.  $V(X)$
- iv.  $V(2X-3)$

- 5) An office switchboard receives telephone calls at the rate of 3 calls per minute on an average. If receiving of calls follows a Poisson distribution, find the probability of receiving: 8

- i. No calls in one-minute interval.
- ii. At least 3 calls in a one-minute interval.
- iii. At most 2 calls in 5-minute interval.

OR

In Binomial distribution consisting of 5 independent trials, the probabilities of 1 and 2 successes are 0.4096 and 0.2048 respectively. Find the parameter 'p' of the distribution.

3. a) Define rectangular distribution. Derive its mean and variance. 7  
b) In an examination, 10% of the students got less than 20 marks and 5% of the students got over 75 marks. Assuming the distribution to be normal, find the mean standard deviation of the distribution. 8
4. a) The joint probability function of random variable X and Y is given by 8  
$$f(x, y) = \begin{cases} k(2x+y) & \text{for } 0 \leq x \leq 2, 0 \leq y \leq 3 \\ 0 & \text{otherwise} \end{cases}$$
  - i. Find marginal density of X and Y.
  - ii. Are X and Y independent?

b) A sample of 20 bulbs, drawn at random from a batch, and discovers that the mean life of the sample bulb is 990 hours with a standard deviation of 22 hours. Find 95% confidence interval for mean. 7

5. a) Explain the criteria of a good estimator. 7

The score of 10 candidates prior and after training are given below. 8

Prior	84	48	36	37	54	69	83	96	90	65
After	90	58	56	49	62	81	84	86	84	75

Is training effective? (use  $\alpha = 5\%$ )

OR

A machine puts out 16 imperfect articles in a sample of 500. After machine is overhauled, it puts out 3 imperfect articles in a batch of 100. Has the machine improved? (use  $\alpha = 5\%$ )

6. a) In a survey of smoking habits of 100 men and 100 women were asked to classify themselves as smokers or non-smokers, the results summarized in the table below. 7

Smoking \ Gender	Men	Women	Total
Yes	54	32	86
No	46	68	114
Total	100	100	200

Do these data provide any association between the smoking habits and gender? Use  $\alpha = 5\%$

- b) The following data gives the ages and blood pressure of 8 women. 8

Age (X)	56	42	36	47	49	42	60	72
Weight (Y)	147	125	118	123	145	140	155	160

- i. Find the correlation coefficient between X and Y. Also, Find the coefficient of determination and interpret it.
- ii. Determine the regression line of Y on X.
- iii. Estimate weight of a woman whose age is 45 years.

7. Write Short note on: (Any Two) 2x5=10

- a) Hypergeometric distribution
- b) Steps in testing hypothesis
- c) Properties of correlation.

*The End*

**POKHARA UNIVERSITY**

Level: Bachelor

Final Assessment

Year: 2025

Programme: (BoCE/BSE)

Full Marks: 100

Course: Probability and Statistics

Pass Marks: 45

Time : 3 hrs

**Attempt all the questions.**

1. a) The expected life of two types of fluorescent lamps in months produced by two companies A and B and their sample size are given below.

Life in bulbs (months):	4 - 8	8 - 12	12 - 16	16 - 20	20 - 24	24 - 28
Sample size from A:	3	5	24	32	12	6
Sample size from B:	9	11	18	34	16	14

Assume that the lamps having uniform life will have long life time and the prices of the lamps produced by two companies are equal. Which companies lamps would you prefer to buy mention your reason. 8

- b) It is observed that 50% of mails are spam. There is software that filters spam mail before reaching the inbox. The accuracy for detecting a spam mail is 99% and chance of tagging a non-spam mail as spam mail is 5%. If certain mail is tagged as spam what is the probability that it is not a spam mail? 7

2. a) The number of hardware failure of a computer system in a week of operation has the following probability mass function

No. of failures:	0	1	2	3	4	5	6
Probability:	0.18	0.28	0.25	0.16	0.04	0.06	0.03

Find the variance of the number of failures in a week. 7

- b) Warranty records show that the probability that a new car needs warranty repairs in the first 90 days is 0.2. If a sample of 6 new cars is selected at random, what is the probability that in the first year i) none needs a warranty repair? ii) at least two needs warranty repair? 8

$$P(X = n) = {}^n C_m p^n q^{m-n}$$

3. a) A set of examination marks is approximately normally distributed with mean of 75 and standard deviation 5. If top 5% of the student got grade A and bottom 25% got grade F. What marks is the lowest A and what marks is highest F. 8

Or

$$Z = \frac{X - \mu}{\sigma}$$

$\lambda^e \lambda^n$

The distance between major cracks in highway follows an exponential distribution with mean of 5 miles. What is the probability that i) there are no major cracks in 10 mile stretch of the highway? ii) what is the standard deviation of the distance between two major cracks? 8

b) A quality control engineer inspects a random sample of 3 batteries from each lot of 24 car batteries ready to be shipped. If such a lot contains 6 batteries with slight defects, what are the probabilities that the inspector's sample will contain i) none of the batteries with defects ii) at least two of the batteries with defect?

4. a) The joint probability distribution of X and Y are:

$$f(x) = k(6 - x - y), \quad 0 < x < 2, \quad 2 < y < 4$$

$$= 0, \text{ otherwise}$$

Find i) k ii) marginal probability density function of x and y, are X and Y independent? 8

b) The population consists of value of 1, 2, 3, 6, 8. Prove that sample mean of size 3 is unbiased estimate of population mean. (without replacement) 7

5. a) A machine produces metal pieces that are in cylindrical shape. The sample pieces having diameters 1.01, 0.97, 1.03, 1.04, 0.99, 0.98, 1.01 and 1.02 centimeter. Construct 95% confidence interval for the mean diameter of the pieces from this machine, assuming the distribution is approximately normal. 8

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

b) In a large city, 16 out of a random sample of 500 men were found to be drinkers. After heavy increase in tax on intoxicants another random sample of 100 men in the same city induced 3 were drinkers. To test decrease in proportion of drinkers is significant after tax increase at 5% level of significance. 7

Or

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

In a random sample of 400 cars manufactured by a company, the number of defective cars was found to be 30. The company however claimed that 5% of their product is defective. Is the claim acceptable at 1% level of significance? 7

6. a) The score of 8 candidates priori and after training are given below.

Priori:	80	48	36	66	72	82	90	60
After:	90	42	45	82	78	75	86	70

Was training effective at 5% level of significance? 7

b) The following data presents the marks obtained by students in mathematics and physics.

Marks in mathematics:	85	60	73	40	82	90
Marks in physics:	92	72	75	65	50	80

Fit the regression equation of marks of physics on marks of mathematics and predict the marks of mathematics whose marks of physics are 52. 8

7. Write short note on any two: (2\*5 = 10)

- a) Histogram
- b) Errors in hypothesis testing
- c) Karl Pearson's correlation coefficient

# UNITED TECHNICAL COLLEGE

Semester: Fall

Level: Bachelor

Program: BE

Course: Probability and Statistics

Year: 2024

Full Marks: 100

Time: 3 hours

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

*Answer all the questions.*

- 1 a) The lives of two models (A and B) of refrigerators in a recent survey are shown below: 7

Life (No of years)		0-2	2-4	4-6	6-8	8-10	10-12
No of refrigerators	Model A	5	16	13	7	5	4
	Model B	2	7	12	19	9	1

Which model has greater uniformity?

- b) The contents of Urns I, II and III are as follows:

1 white, 2 black and 3 red balls

2 white, 1 black and 1 red ball

4 white, 5 black and 3 red balls

One urn is chosen at random and two balls are drawn. They happen to be white and red. What is the probability that they come from Urn I, II and III?

- 2 a) A random variable X is distributed at random between the values 0 and 1 so that its pdf is 5

$$f(x) = \begin{cases} kx^3(4-x)^2 & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Where, k is a constant. Find the value of k, using this value of k find mean and variance of distribution.

- b) A car hire firm has 2 cars that it hires out day by day. The number of demands for a car on each day is distributed as 5

Poisson distribution with mean 1.5. Calculate the proportion of days on which i) Neither car is used ii) some demand is refused  
c) A recent study of how Nepalese spend their leisure time surveyed workers employed more than 5 years. They determined the probability an employee has 2 weeks of vacation time to be 0.45, one week of vacation time to be 0.1 and three or more weeks to be 0.2. Suppose 12 workers are selected at random. Answer the following questions.

- i. What is the probability that at most two of the workers have three or more weeks of vacation time?  
 ii. What is the probability that at least 3 workers have one week of vacation time?
- 3 a) The income of a group of 20,000 persons was found to be normally distributed with mean Rs. 7,500 and standard deviation Rs. 500. Find  
 i. The lowest income of richest 20% of persons  
 ii. The highest income of poorest 10% of persons.  
 b) Two random variables X and Y have the following probability density function. 8  

$$f(x,y) = \begin{cases} k(4-x-y) & 0 < x < 2, 0 < y < 2 \\ 0 & \text{otherwise} \end{cases}$$
 Find  
 i. The constant k  
 ii. Marginal density function of X and Y  
 iii. Conditional probability density function of X given Y  
 iv. E(X) and V(X)  
 4 a) From a population of 540, a sample of 60 individuals is taken. From this sample, the mean is found to be 6.2 and standard deviation 1.368.  
 i. Find the estimated standard error of the mean

- ii. Construct 96% confidence interval for the mean
- b The average weekly wages of a sample of 200 workers in industry A was Rs. 1150 with standard deviation of Rs. 100. The weekly wages of a sample of 300 workers in industry B was Rs. 1,000 with standard deviation of Rs. 50. Can we consider the weekly wages paid by industry A is higher than those paid by industry B? 8
- 5 a In a random sample of 1000 houses in a certain city it was found that 318 own color T.V. In the neighboring city it was found that 450 out of 1200 houses own color T.V. Test whether there is significant difference between the two samples of housing with respect to using color T.V. at 5% level of significance 7
- b The average gas mileage for 12 cars of brand A was 27.2 miles per gallon and standard deviation was 3.8 miles per gallon. The 9 brand B cars that were tested averaged 32.1 miles per gallon and the standard deviation was 4.3 miles per gallon. At 0.01 level of significance should it conclude that brand A cars have lower average gas mileage than do brand B cars? 8
- 6 a Where people turn to for news is different for various age groups. A study indicated where different age group primarily get their news. 1

Media	Age group		
	Under 36	36-50	Above 50
Local TV	17	11	13
National TV	7	10	12
Radio	7	9	10
Local Newspaper	5	7	10
Internet	9	8	7

At the 0.05 level of significance, is there evidence of a significant relationship between the age group and where people primarily get their news?

- b Shear stress ( $y$ ) and rate of shear ( $x$ ) can be measured for a liquid in a viscometer. For 12 pairs of values the data can be summarized as:

$$\sum X = 132, \sum Y = 151.7, \sum X^2 = 1944, \sum Y^2 = 2570.48, \\ \sum XY = 2233.2$$

- i. Find the linear regression equation of  $y$  on  $x$
- ii. What is the correlation coefficient?
- iii. What fraction of the variance of  $y$  is explained by  $x$ ?

- 7 Write short notes on any TWO. 5 × 2
- a Errors in Hypothesis Testing
  - b Describe Types of Sampling
  - c Importance of Statistics in Engineering

**"BEST of LUCK"**