

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY

(Affiliated to Pokhara University)

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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.

$21.636 \times 23.40 \times$

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

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

$\theta \cdot 1$

- 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.

$$\hat{y} = -10.35 + 0.24x$$

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

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(N)~~