POKHARA UNIVERSITY

Level: Bachelor | Semester: Spring | Year : 2024
Programme: BE | Full Marks : 100
Course: Probability and Statistics (New) | 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) The factories produces 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.

b) State Baye's Theorem. In a certain factory, machines X, Y and Z are 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, find: 8

i. The probability that it is defective.

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

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)

b) 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

$$f(x,y) = \begin{cases} k(2x+y) & for\ 0 \le x \le 2, 0 \le y \le 3 \\ 0 & otherwise \end{cases}$$

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

b) 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 α=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 α=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 summarizes in the table below. 7

Gender / Smoking	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 α=5%.

b) The following table 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	128	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 women whose age is 45 years.

7. Write short notes on: (**Any two**) 2×5

a) Hypergeometric distribution

b) Steps in testing hypothesis

c) Properties of correlation