Nepal College of Information Technology

Level: Bachelor | Semester: Fall | Year: 2023
Programme: BE SE (M & D) | Full Marks: 50
Course: Probability and Statistics | Pass Marks: 22.5
Time: 1.5 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) Define independent and dependent events with suitable example. A consignment of 15 pens contains 2 defective pens. Two pens are taken at random from the consignment without replacement. What is the probability that **7**

   i. both are defective

   ii. both are non-defective

   b) The joint probability distribution of two discrete random variables X and Y is given as: **8**

Y \ X	1	2
0	0	1/8
1	3/8	0
2	3/8	0
3	0	1/8

   i. Find the marginal distribution of X and Y.

   ii. Find the conditional distribution of $X = x$ given $Y = 2$.

   iii. Test whether X and Y are independent.

   iv. Find E(X) and V(X).

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: 7

X :	0	1	2	3	4
P(X) :	.35	.39	.19	.06	.01

Calculate the expected value, variance and standard deviation of X.

b) State Bayes' Theorem. In a class of 75 students, 15 were considered to be very intelligent, 45 as medium and the rest below average. The probability that a very intelligent students fails in a viva – voce examination is 0.005; the medium student failing has a probability of 0.05; and the corresponding probability for a below average student is 0.15. If a student is known to have passed the viva – voce examination, what is the probability that he is below average? 8

3. a) The length of time (in minutes) that the certain lady speaks on the telephone is found to be random phenomenon, with a probability function specified by the probability density function 8

$$f(x) = \begin{cases} Ae^{-\frac{x}{5}} & , x > 0 \\ 0, \quad \text{otherwise} \end{cases}$$

Find:

i. Find the value of A.

ii. What is the probability that the number of minutes that she will talk over the phone is

a) More than 10 minutes.

b) Less than 5 minutes and

c) Between 5 and 10 minutes?

b) Define the classical definition of Probability. The odds in favour of A solving a mathematical problem are 3 to 4 and the odds against B solving the problem are 5 to 7. Find the probability that the problem will be solved by at least one of them. 7

4. Write short notes on any **ONE**: **1 × 5 = 5**

a) Laws of Probability

b) Random Variable