



BANNARI AMMAN INSTITUTE OF TECHNOLOGY

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22AM301– PROBABILITY AND STATISTICS

ASSIGNMENT – I

1. The production line of a factory manufactured bolts using three machines A, B and C. Of the total output, machine A is responsible for 35%, machine B for 40% and machine C for the rest. It is known from previous experience with the machines that 5% of the output from machine A, 3% from machine B and 4% from machine C are defectives.
 - (i) Identify the percentage of bolts produced by machines A, B, C in a company.
 - (ii) Find the chance of defective bolts produced by Machines A, B and C.
 - (iii) Find the chance that the bolt chosen at random from the production line to be defective.
2. A child psychologist is interested in the number of times a newborn baby's crying wakes its mother after midnight. For a random sample of 50 mothers, the following information was obtained. Let X be the number of times a newborn wakes its mother after midnight and $P(X=x)$ be the probability that X takes on a value x

x	0	1	2	3	4	5
$P(x)$	$2/50$	$11/50$	k	$9/50$	$4/50$	$1/50$

Calculate the value of 'k'.

Find the chance of a newborn waking its mother at least three times after midnight

Find the chance of a newborn waking its mother at most two times after midnight.

Compute the expected number of times a newborn wakes its mother after midnight.

3. The diameter of an electric cable X is a continuous random variable with probability density function $f(x)=c(x+3)$, $2 < x < 8$.
 - (i) Find the value of 'c'.
 - (ii) Compute the chance of diameter of an electric cable between 3 and 5.
 - (iii) Find the chance of diameter of an electric cable is more than 4.
 - (iv) Calculate the expected diameter of an electric cable.

4. The joint probability mass function of (X, Y) is given by $P(x, y) = \frac{x+y+1}{27}$, $x = 0, 1, 2$; $y = 1, 2, 3$.

Find all the marginal distribution and conditional probability distributions. Also, find the probability distribution of $(X+Y)$ and $P(X+Y>3)$.

5. The following table gives the data on rainfall (x inches) and discharge in a certain river (y units). Obtain the covariance, correlation coefficient and lines of regression of x on y and y on x. Estimate from it, the discharge corresponding to a rainfall of 2 inches.

X	1.5	1.8	2.6	3.0	3.4
y	34	36	40	46	54

6. The joint density of two random variables X, Y is $f(X, Y) = 2e^{-X-Y}$; $0 < X < Y < \infty$. Consider the transformation $U=2X$ and $V=Y-X$. Find the joint density of U and V. Check whether U and V are independent or not?

7. A large population has a mean of 75 and standard deviation of 15. If random samples of size 49 are drawn from this population. By Central limit theorem, what is the probability that the sample mean will be

- (i) between 70 and 80 (Normal distribution table value is 0.4901)
- (ii) At least 72 (Normal distribution table value is 0.4192)
- (iii) At most 79 (Normal distribution table value is 0.4963)

8. A sample of 900 students from Madras University was taken and their average weight was found to be 117 pounds with a S.D. of 25 pounds. Could the mean weight of the student in the population be 120 pounds?

(Table Value: Z=1.96).