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Department of Computer Technology B. Tech in Computer Science and Engineering (IOT)

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Session 2025-2026

Vision: To develop strong analytical and computational skills in students for solving real-life statistical problems using R programming.	**Mission:** To train students in applying probability distribution concepts for discrete random variables in R, enhancing their problem-solving ability and technical competency through hands-on practice.

Program Educational Objectives of the program (PEO): (broad statements that describe the professional and career accomplishments)

PEO1	**Preparation**	**P: Preparation**	**Pep-CL abbreviation pronounce as Pep-si-lL easy to recall**
PEO2	**Core Competence**	**E: Environment (Learning Environment)**	
PEO3	**Breadth**	**P: Professionalism**	
PEO4	**Professionalism**	**C: Core Competence**	
PEO5	**Learning Environment**	**L: Breadth (Learning in diverse areas)**	

Program Outcomes (PO): (statements that describe what a student should be able to do and know by the end of a program)

Keywords of POs:
Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

PSO Keywords: Cutting edge technologies, Research

"I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life." *to contribute to the development of cutting-edge technologies and Research*.

Integrity: I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

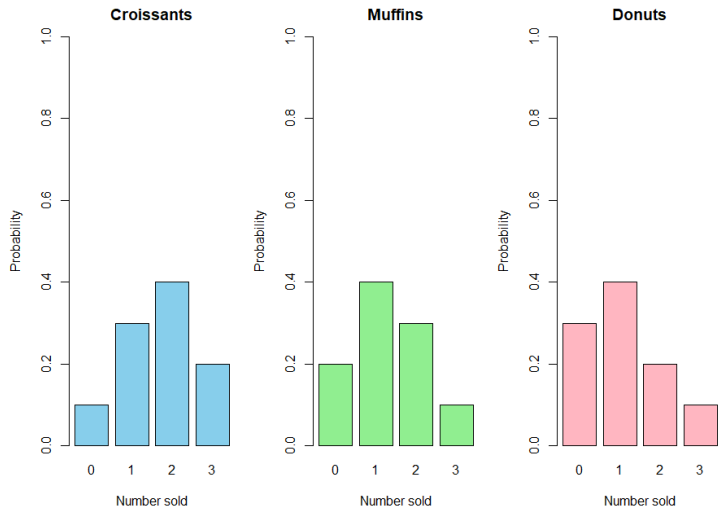
Name and Signature of Student and Date
(Signature and Date in Handwritten)

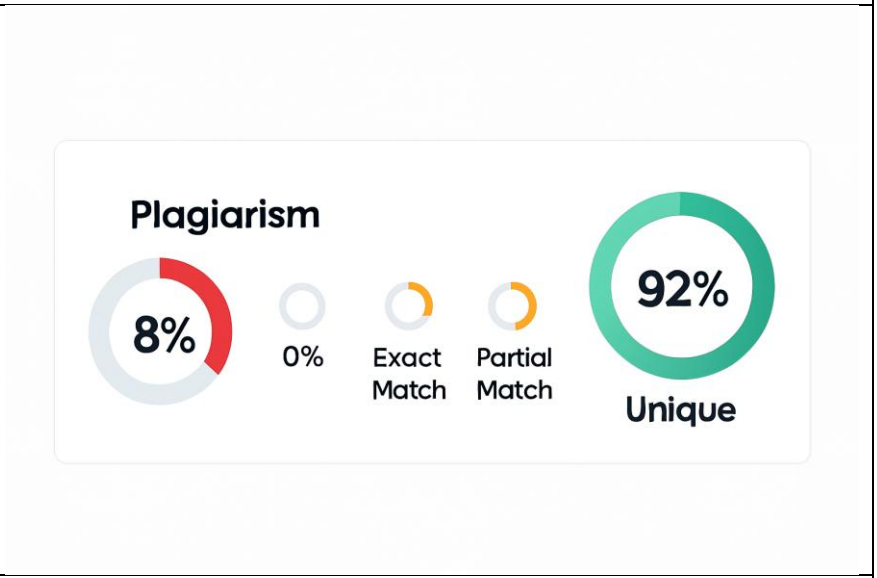
Session	**2025-26**	**Course Name**	**MFDA (LAB)**
Semester	**5**	**Course Code**	**23IOT1306**
Roll No	**42**	**Name of Student**	**Karan F. Chopkar**

Practical Number	**01 (A)**
Course Outcome	1. Apply probability distribution concepts in solving problems using R programming. 2. Calculate expected value, variance, and standard deviation for discrete random variables. 3. Visualize probability distributions through bar plots.
Aim	Solve the problems using probability distribution in R for discrete random variables.
Problem Definition	A local bakery sells three types of pastries: Croissants, Muffins, and Donuts. The daily sales for each type of pastry follow a certain probability distribution. The owner wants to understand the sales pattern better to manage inventory efficiently. Sales Data: Croissants: 0 pastries sold with probability 0.1 1 pastry sold with probability 0.3 2 pastries sold with probability 0.4 3 pastries sold with probability 0.2 Muffins: 0 pastries sold with probability 0.2 1 pastry sold with probability 0.4 2 pastries sold with probability 0.3 3 pastries sold with probability 0.1 Donuts:

	0 pastries sold with probability 0.3 1 pastry sold with probability 0.4 2 pastries sold with probability 0.2 3 pastries sold with probability 0.1
Theory (100 words)	Probability distribution describes how the probabilities are distributed over the possible values of a random variable. For a discrete random variable X, the expected value is $E[X]=\sum x_i p_i$, variance is $Var(X)= \sum(x_i-u)^2 pi$, and standard deviation is the square root of variance. These measures help in understanding the central tendency and dispersion of the data. In R, such computations can be implemented using custom functions for expected value and variance, and results can be visualized using barplot() to interpret the distribution effectively.
Procedure and Execution (100 Words)	Steps for implementation: 1. Define vectors for possible sales (x) and their probabilities (p) for each pastry type. 2. Create functions for expected value and variance. 3. Calculate mean, variance, and standard deviation for each pastry type. 4. Display the results in a clear format. 5. Use the barplot() function to visualize probability distributions. 6. Interpret the outputs and plots to understand the sales pattern.
	Code: rm(list = ls()) x <- 0:3 croissant_p <- c(0.1, 0.3, 0.4, 0.2) muffin_p <- c(0.2, 0.4, 0.3, 0.1) donut_p <- c(0.3, 0.4, 0.2, 0.1) expected_value <- function(x, p) { base::sum(x * p)

```
}

variance_discrete <- function(x, p) {
  mu <- expected_value(x, p)
  base::sum((x - mu)^2 * p)
}

c_mean <- expected_value(x, croissant_p)
c_var  <- variance_discrete(x, croissant_p)
c_sd   <- sqrt(c_var)

m_mean <- expected_value(x, muffin_p)
m_var  <- variance_discrete(x, muffin_p)
m_sd   <- sqrt(m_var)

d_mean <- expected_value(x, donut_p)
d_var  <- variance_discrete(x, donut_p)
d_sd   <- sqrt(d_var)


cat(sprintf("Croissants -> Mean: %.3f  Variance: %.3f  SD:
%.3f\n", c_mean, c_var, c_sd))
cat(sprintf("Muffins    -> Mean: %.3f  Variance: %.3f  SD:
%.3f\n", m_mean, m_var, m_sd))
cat(sprintf("Donuts     -> Mean: %.3f  Variance: %.3f  SD:
%.3f\n", d_mean, d_var, d_sd))


op <- par(mfrow = c(1, 3), mar = c(4, 4, 3, 1))

barplot(croissant_p, names.arg = x, ylim = c(0, 1),
        main = "Croissants", xlab = "Number sold", ylab =
"Probability",
        col = "skyblue")

barplot(muffin_p, names.arg = x, ylim = c(0, 1),
        main = "Muffins", xlab = "Number sold", ylab =
"Probability",
        col = "lightgreen")

barplot(donut_p, names.arg = x, ylim = c(0, 1),
        main = "Donuts", xlab = "Number sold", ylab =
"Probability",
        col = "lightpink")
```

	par(op)
	Output:  □ Croissants → Mean: 1.700, Variance: 0.810, SD: 0.900 □ Muffins → Mean: 1.300, Variance: 0.810, SD: 0.900 □ Donuts → Mean: 1.100, Variance: 0.890, SD: 0.943
Output Analysis	Croissants have the highest expected sales, while Donuts have the largest variance, indicating greater fluctuation in sales. Muffins and Croissants have equal variance but different means.
Link of student Github profile where lab assignment has been uploaded	https://github.com/karan-0123/MFDA-Lab

Conclusion	This practical successfully demonstrated the application of probability distribution for discrete random variables in R. Students learned how to compute statistical measures like mean, variance, and standard deviation, and visualize the results, enhancing analytical and programming skills.
Plag Report (Similarity index < 12%)	
Date	14/08/2025