

RAN-2411000802010001**M.Sc. (AI-ML) (Sem.-II) Examination April - 2026****201 - Probability and Statistics****Time: 3 Hours]****[Total Marks: 70****સૂચના : / Instructions**

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book

Seat No.:

Student's Signature

Q.1. Do as directed (Any 2)**14**

- A. A hospital surveyed 400 patients based on their type of visit and collected the following data.

	OPD	Admitted	Total
Male	90	110	200
Female	50	150	200
Total	140	260	400

If a patient is selected randomly :

- (1) Find the probability that the patient is admitted.
 - (2) Find the probability that the patient is Male or Admitted.
 - (3) If the patient is selected from OPD, find the probability that the patient is Male.
- B. In a class of 120 students, 60% of the students take Accounting, 25% take Economics, and 15% take both Accounting and Economics.
- 1) Find the probability that a randomly selected student takes either Accounting or Economics.
 - 2) Find the probability that a student takes neither Accounting nor Economics.
 - 3) If a student is known to take Accounting, find the probability that the student also takes Economics.
- C. Define discrete and continuous probability distribution. Discuss the key properties of the discrete probability distribution.

Q.2. Do as directed. (Any 2)**14**

- A. Explain Stratified Sampling method. Evaluate the method by discussing its advantages and limitations.
- B. What is Sampling Error? Explain its causes and strategies to minimize it.
- C. Explain the concept of a random variable and expected value with suitable example.

Q.3. Do as directed (Any 2)**14**

- A. A university claims that students spend 20 hours per week on laboratory experiments on average. A random sample of 81 students shows a mean of 22 hours. The population standard deviation is 5 hours. Test the university's claim at the 5% significance level and justify your conclusion.
- B. An agricultural research centre wants to compare the average crop yield (in quintals per hectare) from two different regions, Region A and Region B. A sample of 100 farms from each region is selected. The mean yield in Region A is 45 quintals, with a population standard deviation of 6 quintals. The mean yield in Region B is 47 quintals, with a population standard deviation of 7 quintals. Test whether there is a significant difference in the mean crop yield at the 5% significance level.
- C. Explain one-tailed and two-tailed hypothesis testing with suitable examples.

Q.4. Do as directed (Any 2)**14**

- A. A bookstore wants to explore how the price of a specific best seller influences its weekly sales (in copies sold). The following data is available. Plot a scatter diagram and interpret it to evaluate the strength and direction of the correlation between the price and weekly sales.

Price (in ₹ hundred)	10	11	12	13	14	15	16
Sales (copies sold)	60	55	50	44	38	32	28

- B. The following data shows the years of experience of bank employees and their corresponding annual performance scores. Calculate the correlation coefficient between years of experience and performance scores using Karl Pearson's method and interpret the result.

Experience in years	8	10	12	14	16	18	20
Performance score	65	68	70	74	77	75	82

- C. Two HR managers independently rank 10 job applicants based on their performance in a recruitment assessment. Find the Spearman's Rank Correlation Coefficient between the rankings given by the two managers and interpret the result.

Applicant	1	2	3	4	5	6	7	8	9	10
Rank given by First HR Manager	3	5	8	4	7	10	2	1	6	9
Rank given by Second HR Manager	6	4	9	8	1	2	3	10	5	7

Q.5. Do as directed**14**

- A. From the following data of price (in ₹) and demand (in hundred units) of a commodity for 6 months, obtain the regression line of demand on price. Also, estimate the demand when price is ₹ 20

Price (in ₹)	21	15	16	18	14	12
Demand (in hundred units)	15	20	18	17	22	28

- B. Define correlation and regression. Compare the properties of the correlation coefficient and regression coefficients.