

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION SP2024)

CLASS: BTECH
BRANCH: AIML

SEMESTER: IV
SESSION: MORNING

SUBJECT: AI201 PROBABILITY AND STATISTICAL ANALYSIS

TIME: 03 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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- Q.1(a) Discuss the various ways of describing a dataset. [5] CO BL
Q.1(b) The following data relates to the yield in grams(y) and the matured pods (x) of 10 [5] CO1 BL1
groundnut plants. Find out the Pearson's correlation coefficient. BL2
BL3

X:	14	34	20	16	11	20	17	13	14
Y:	16	40	21	18	12	15	20	22	17

- Q.2(a) Meningitis causes stiff necks with probability 0.5. The prior probability of having [5] CO2 BL2
meningitis is 0.00002. The prior probability of having a stiff neck is 0.05. What is BL3
the probability of having meningitis given that you have a stiff neck?
- Q.2(b) Six men and five women apply for an executive position in a small company. Two of [5] CO2 BL2
the applicants are selected for an interview. Let X denote the number of women in BL3
the interview pool. The probability mass function of X as:

X = x	0	1	2
P (x)	2/11	5/11	4/11

How many women do you expect in the interview pool?

- Q.3(a) A manufacturer produces light-bulbs that are packed into boxes of 100. If quality [5] CO2 BL3
control studies indicate that 0.5% of the light-bulbs produced are defective, what BL4
percentage of the boxes will contain: (a) no defective? (b) 2 or more defectives?
- Q.3(b) A random sample of 395 people was surveyed and each person was asked to report BL2
the highest education level they obtained. The data that resulted from the survey BL3
are summarized in the following table: BL4
BL5

	High School	Bachelors	Masters	PhD	Total
Female	60	54	46	41	201
Male	40	44	53	57	194
Total	100	98	99	98	395

Are gender and education level dependent at a 5% level of significance? In other words, given the data collected above, is there a relationship between the gender of an individual and the level of education that they have obtained? (Note: Chi Square Tabulated = 7.815)

- Q.4(a) What do you mean by Maximum Likelihood Estimators. Explain its significance. [5] CO4 BL1
BL2
- Q.4(b) Explain the following terms with relevant examples: [5] CO4 BL1
BL2
- Degree of Freedom
 - Level of Significance
 - Confidence Interval

Q.5(a)	A gym trainer claimed that all the new boys in the gym are above average weight. A random sample of thirty boys' weight have a mean score of 112.5 kg and the population mean weight is 100 kg and the standard deviation is 15. Is there sufficient evidence at 5% level of significance to support the claim of gym trainer. (Note: Z Tabulated = 1.645)	[5]	C05	BL3 BL4
Q.5(b)	What do you mean by hypothesis. Explain null and alternative hypothesis and type I and type II error.	[5]	C05	BL1 BL2

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