

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-III EXAMINATION – SUMMER 2025****Subject Code:3130006****Date:13-06-2025****Subject Name:Probability and Statistics****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Define independent events and provide an example **03**  
 (b) A coin is tossed three times. What is the probability of getting exactly two heads? **04**  
 (c) Find the best fitting parabola: **07**

x	1	2	3	4	5
y	2	5	10	17	26

- Q.2** (a) Does there exist a binomial distribution for which variance is greater than mean? **03**  
 (b) A biased coin returns head 10% of times. Find the probability of getting exactly 2 heads in 10 trials using binomial distribution. **04**  
 (c) A factory has three machines A, B, and C producing 20%, 30%, and 50% of the total items, respectively. The probabilities of producing a defective item are 1%, 2%, and 3% for A, B, and C, respectively. If an item is defective, what is the probability that it was produced by machine B? **07**

**OR**

- (c) A factory produces light-bulbs. The probability of a bulb being defective is 0.02. If 200 bulbs are tested, use the Poisson approximation to find the probability that at least three bulbs are defective. **07**
- Q.3** (a) Find the mean and median of 2, 3, 5, 7 **03**  
 (b) Calculate the rank correlation: **04**

x	1	2	3	4	5
y	2	1	5	4	3

- (c) Find the correlation coefficient. **07**

x	1	2	3	4	5	6	7
y	6	8	11	9	12	10	14

**OR**

- Q.3** (a) Find mode **03**

x	0-10	10-20	20-30	30-40
y	10	20	40	30

- (b) Calculate first four central moments of observations 3,5,7,13 **04**  
 (c) Find regression line of Y on X **07**

x	2	4	6	8	10
y	5	12	19	26	33

- Q.4** (a) Explain the terms one-tailed and two-tailed test **03**  
 (b) In a sample of 500 bulbs 20 are found defective. The company claims that only 2% bulbs are defective. Test the reality of claim at 5% level of significance. **04**

- (c) Test whether the following samples could have been drawn from population with same SD. **07**

	Sample A	Sample B
Size	100	200
SD	10	11

**OR**

- Q.4** (a) Explain the terms null and alternate hypothesis **03**  
 (b) A coin returned 531 heads in 1000 tosses. Is it biased? [Use  $\alpha = 0.05$ ] **04**  
 (c) Use chi-square test to determine whether smoking and hypertension are independent at 5% level of significance [ $\chi^2(\alpha = 0.05, df = 1) = 3.84$ ] **07**

	Smoking	No Smoking
Hypertension	30	20
No Hypertension	10	40

- Q.5** (a) State Chebyshev's inequality. **03**  
 (b) Two cards are chosen randomly from deck. What is probability that (a) both are ace? (b) both are black? (c) none is ace (d) none is black **04**  
 (c) Weight of 1000 experimental animals is normally distributed with mean 235 grams and standard deviation 35. How many animals weigh (a) below 172 grams (b) above 312 grams (c) between 172 to 312 grams. [P(Z=1.8)=0.4641, P(Z=2.2)=0.4841] **07**

**OR**

- Q.5** (a) If A and B are independent events with P(A)=0.5, P(B)=0.4 then find P(A∪B) **03**  
 (b) Find the best fitting line to the points (1,1), (2,4), (3,9), (4,16) **04**  
 (c) Fit the curve  $y = ab^x$  **07**

x	1	2	3	4
y	35	70	140	280

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