**Seat No.: _____** **Enrolment No._____**

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–IV (NEW) - EXAMINATION – SUMMER 2017**

**Subject Code: 2142505** **Date: 06/06/2017**

**Subject Name: Probability and Introduction to Statistics**

**Time: 10:30 AM to 01:00 PM** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

| | | | **MARKS** |
|---|---|---|---|
| **Q.1** | | **Short Questions** | **14** |
| | **1** | Random Variable | |
| | **2** | Conditional Probability | |
| | **3** | Correlation Coefficient | |
| | **4** | Mutually Exclusive Events | |
| | **5** | Bivariate Frequency Distribution | |
| | **6** | Statistical Population | |
| | **7** | Standard Deviation | |
| | **8** | Scatter Diagram | |
| | **9** | Conditional Probability | |
| | **10** | Sampling Distribution | |
| | **11** | Primary Data | |
| | **12** | Null Hypothesis | |
| | **13** | Type-I and Type-II error | |
| | **14** | Systematic Sampling | |
| **Q.2** | **(a)** | Compare the measures of dispersion. | **03** |
| | **(b)** | The probability that A hits a target is 0.25, and the probability that B hits the target is 0.4. Both shoots at the target. Find the probability that at least one of them hits the target. | **04** |
| | **(c)** | Three groups of children contain respectively 3 girls and 1 boy; 2 girls and 2 boys; 1 girl and 3 boys. One child is selected at random from each group, find probability that the selected group of three children consist of 1 girl and 2 boys. | **07** |

**OR**

| | | | |
|---|---|---|---|
| | **(c)** | Customers are used to evaluate preliminary product designs. In the past, 95% of highly successful products received good reviews, 60% of moderately successful products received good reviews, and 10% of poor products received good reviews. In addition, 40% of products have been highly successful, 35% have been moderately successful, and 25% have been poor products.<br>a) What is the probability that a product attains a good review?<br>If a new design attains a good review, what is the probability that it will be a highly successful product? | **07** |
| **Q.3** | **(a)** | Differentiate between Primary and Secondary Data | **03** |
| | **(b)** | Compare various measures of central tendencies. | **04** |
| | **(c)** | Find median and mode of the following data | **07** |

| Class | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
|---|---|---|---|---|---|---|
| Frequency | 12 | 10 | 15 | 17 | 8 | 3 |

**OR**

| | | | |
|---|---|---|---|
| **Q.3** | **(a)** | Differentiate between Descriptive Statistics and Inductive Statistics. | **03** |
| | **(b)** | Explain Skewness and Kurtosis. | **04** |

**(c)** Fluctuations in the daily sales of two products, X and Y, are given below. Find out which of the two shows greater fluctuation in sales. **07**
Product X: 620, 624, 622, 625, 622, 618, 619, 616, 623, 625, 626, 625.
Product Y: 2152, 2134, 2132, 2145, 2132, 2142, 2146, 2130, 2146, 2142, 2150, 2135, 2152.

**Q.4** **(a)** Define expectations of Random Variable and list its properties **03**

**(b)** Explain z-test with suitable example. **04**

**(c)** In the inspection of tin plate produced by a continuous electrolytic process, 0.2 imperfections spotted per minute, on average. Find the probabilities of spotting **07**

1. One imperfection in 3 minutes;
2. At least two imperfections in 5 minutes;

At most one imperfection in 15 minutes.

**OR**

**Q.4** **(a)** Define variance of a Random Variable and list its properties **03**

**(b)** Explain t-test with suitable example. **04**

**(c)** A manufacturer of optical lenses has the following data on the cost per unit (in Rs.) of certain custom-made lenses and the number of units made in each order. **07**

| No. of Units (X) | 1 | 3 | 5 | 7 | 10 | 12 |
|---|---|---|---|---|---|---|
| Cost/unit (Y) | 58 | 52 | 46 | 40 | 37 | 22 |

Use the regression equation to predict the unit cost in an order of 8 of these lenses.

**Q.5** **(a)** Suppose X is the normal distribution N(70, 4). Find P(X≥ 73) **03**

**(b)** Explain Joint Probability Distribution of two random variables. **04**

**(c)** The following are the number of mistakes made in 5 successive days for 4 technicians working for a photographic laboratory: **07**

| | | | | | |
|---|---|---|---|---|---|
| **Technician I** | 6 | 14 | 10 | 8 | 11 |
| **Technician II** | 14 | 9 | 12 | 10 | 14 |
| **Technician III** | 10 | 12 | 7 | 15 | 11 |
| **Technician IV** | 9 | 12 | 8 | 10 | 11 |

Test at the level of significance $\alpha = 0.01$ whether the differences among the 4 sample means can be attributed to chance.

**OR**

**Q.5** **(a)** Suppose a random variable X has the following probability function: **03**

| X | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| P(X) | 0.1 | 0.2 | 0.3 | 0.4 |

Find expectation and variance of X.

**(b)** Prove that the standardized normal random variable Z has mean zero and standard deviation 1. **04**

**(c)** A trucking firm is suspicious of the claim that the average lifetime of certain tires is at least 28000 miles. To check the claim, the firm puts 40 of these tires on its trucks and gets a mean lifetime of 27463 miles with a standard deviation of 1348 miles. What can it conclude if the probability of Type I error is to be at most 0.01? **07**

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