# LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **STATISTICS**

FIFTH SEMESTER – **NOVEMBER 2024**

**UST 5504 – TESTING OF HYPOTHESES**

Date: 18-11-2024 Dept. No. Max. : 100 Marks

Time: 09:00 am-12:00 pm

## SECTION A

**Answer ANY FOUR of the following** **(4x10=40)**

1. Show that the family P(λ) has MLR property.
2. Explain the concepts of SPRT.
3. Let $X_1, X_2, \ldots, X_n$ be iid B(1,p) random variables. Find the best critical region of level α for testing $H_0$: $p = p_0$ Vs $H_1: p = p_1 \left(p_1 > p_0\right) \wedge for\ the\ case\ where \left(p_1 < p_0\right)$.
4. Write various steps involved in the testing of hypothesis.
5. Let p be the probability of getting head in a single toss. In order to test $H_0$: p = ½ Vs $H_1$: p = ¾, coin is tossed 5 times and reject $H_0$ if more than 3 heads are obtained. Find the probabilities of type I and type II errors.
6. From the given table, find out whether there is any relationship between gender and colour preference:

| Colour | Male | Female |
|---|---|---|
| Red | 25 | 45 |
| Blue | 45 | 25 |
| Green | 50 | 10 |

7. Discuss the procedure for one sample Kolmogorov- Smirnov test.
8. The mean lifetime of a sample of 1000 bulbs is found to be 1580 hours with S.D of 90 hours. Test the hypothesis that mean lifetime of bulbs produced by the company is 1600 hours.

## SECTION B

**Answer ANY THREE of the following** **(3x20=60)**

9. State and prove Neyman-Pearson lemma.
10. Obtain LRT for testing the mean of a normal population.
11. Obtain LRT for testing the equality of mean of two normal populations.
12. Explain the procedures for (i) Mann-Whitney U test and (ii) Sign Test.
13. a. Ten soldiers participated in a shooting competition in the first week. After intense training they participated in a competition the next week. Their scores are given as follows:

| **Soldiers** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Before** | 67 | 24 | 57 | 55 | 63 | 54 | 56 | 68 | 33 | 43 |
| **After** | 70 | 38 | 58 | 58 | 5 | 67 | 68 | 75 | 42 | 38 |

Do the data indicate that the soldiers have been benefitted by the training?

b. Show that one parameter exponential family possess MLR property. **(15+5)**

14. Three types of fertilizers are used on three groups of plants for 5 weeks. Using the data given, check if there is a difference in the mean growth between the three groups at 0.05 significant level using One-Way ANOVA.

| | | | | | | |
|---|---|---|---|---|---|---|
| **F 1** | 6 | 8 | 4 | 5 | 3 | 4 |
| **F 2** | 8 | 12 | 9 | 11 | 6 | 8 |
| **F 3** | 13 | 9 | 11 | 8 | 7 | 12 |

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