

Your Roll Number .....

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Examination: M.Sc. (Clinical Research), Semester: I (2023)

Paper Code and Title: MCR-GEC-101-BIOSTATISTICAL METHODS IN CLINICAL RESEARCH

Time: 1.5 hours

Maximum Marks: 30

Write the roll number at the top immediately on receipt of this question paper. Attempt ALL questions. All parts of a question must be attempted in continuation. Start answering each question on new page.

## SECTION A

Answer all questions [0.5x12=6 marks]

Fill in the blanks in the following statements:

1. Type I error is when Null Hypothesis \_\_\_\_\_ and Alternative Hypothesis \_\_\_\_\_ wrongly.
2. Quantitative variables that has only fixed or finite values are called \_\_\_\_\_ variables.
3. The second quartile Q2 is also called the \_\_\_\_\_.
4. A random sample of 16 observations produced a sample mean of  $\mu = 92.4$  and  $s = 25.8$ . The value of the standard error of  $\mu$  is \_\_\_\_\_.
5. The \_\_\_\_\_ the P-value, the stronger the evidence against the null hypothesis provided by the data.
6. The average height of a random sample of 25 American adult males is found to be  $\mu = 170$  cm with a standard deviation of 24.15 cm. A 90% confidence interval for  $\mu$  is \_\_\_\_\_.
7. The null hypothesis is rejected when probability is at the 5% level accepted when probability is at the 1% level. \_\_\_\_\_ (TRUE or FALSE).
8. We randomly pick six items to compare their prices at two supermarkets. The degrees of freedom if we use a two-sample t-test is \_\_\_\_\_.
9. In a random sample of 900 students,  $p=0.64$  (64%) were in favour of organizing an educational tour from the department. The standard error of  $p$  is \_\_\_\_\_.
10. \_\_\_\_\_ is a positive attribute and \_\_\_\_\_ is a negative attribute about SAS.

## SECTION B

Attempt any two questions from the following [6x2=12 marks]

11. Out of 100 patients of myocardial infarction, 37 patients had bradycardia and 66 had posterior wall infarct. If 28 patients had neither bradycardia nor posterior wall infarct, test whether the incidence of bradycardia has any predilection for the site of infarction.
12. The breathing capacity of seven patients of heart disease before and after treatment for ascites is given below. Write the null and alternative hypothesis. What is your conclusion regarding the efficacy of the treatment?

|                  |     |     |    |    |    |    |    |
|------------------|-----|-----|----|----|----|----|----|
| Before Treatment | 102 | 89  | 32 | 82 | 36 | 56 | 79 |
| After treatment  | 132 | 116 | 50 | 82 | 61 | 64 | 92 |

13. The effectiveness of advertising for two rival products were (Brand X and Brand Y) were compared. While six participants rated X with scores of 3, 4, 2, 6, 2 and 5, another 6 participants rated Y with scores of 9, 7, 5, 10, 6 and 8 out of a maximum score of 10. Write the null and alternative hypothesis. What is your conclusion after analysis?
14. Blood glucose level is known to be higher in pigeons than in rabbits. Prove it by applying statistical test to the following data. Clearly show calculations how you arrived at the answer.

| Variable | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pigeons  | 200 | 186 | 176 | 184 | 170 | 172 | 170 | 163 | 176 | 173 |
| Rabbits  | 145 | 125 | 100 | 112 | 127 | 139 | 151 | 140 | 159 | 132 |

### SECTION C

Attempt any three questions from the following [4x3=12 marks]

- Describe different types of correlation with examples. Draw figures to explain.
- Explain the difference between standard deviation and standard error of mean. How are these related?
- Discuss the advantages and disadvantages of types of randomisation.
- Enumerate the importance of ANOVA. When and how will you find out the difference between groups?
- An active-controlled randomized trial proposes to assess the effectiveness of Drug A in reducing pain. A previous study showed that Drug A can reduce pain score by 5 points from baseline to week 24 with a standard deviation (s) of 1.195. A clinically important difference of 0.5 as compared to active drug is considered to be acceptable. Consider a drop-out rate of 10%. What should be the sample size for the study with alpha value, that is, Type I error of 5% (0.05) and power of 80%. ( $Z_{\alpha/2} = Z_{0.05/2} = Z_{0.025} = 1.96$  at type 1 error of 5% and  $Z_{\beta} = Z_{0.20} = 0.842$  at 80% power).

Table values:

Chi-sq = 3.84 for 1 df at  $p=0.05$

T = 2.57 for df 5, 2.45 for df 6, 2.37 for df 7, 2.31 for df 8, 2.26 for df 9 and 2.23 for df 10 at  $p=0.05$

U(5,5)=2 at  $p=0.05$