20U460 (Pages: 2) Name: .....

Reg.No: .....

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2022

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U STA4 C04 - STATISTICAL INFERENCE AND QUALITY CONTROL

(Statistics - Complementary Course)

(2019 Admission onwards)

Time : 2.00 Hours Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 2 marks.

1. Briefly explain the properties of a good estimator.
2. Define consistency.
3. $V(t_1) = 20.22$ and $V(t_2) = 12$. Compute the relative efficiency of t_2 with respect to t_1.
4. What is sufficiency?
5. Explain interval estimation.
6. Define type I error.
7. Define Neymann Pearson lemma.
8. What is the critical region for testing the equality of population proportions?
9. Explain Small sample tests and large sample tests.
10. Define ANOVA.
11. Briefly explain Wilcoxon test.
12. Write down the control limits for p- chart.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer ***all*** questions. Each question carries 5 marks.

13. Examine whether the sample variance is an unbiased estimator of the population variance for a normal population $N(\mu, \sigma)$.
14. If $f(x, \lambda) = \frac{e^{-\lambda}\lambda^x}{x!}$, $\lambda > 0$, $x = 0, 1, 2....$,then estimate λ by the method of moments.
15. Explain the method of constructing 95% confidence interval for the proportion 'p' of possessing a characteristic in a population.
16. The nicotine content in mgms of two samples of tobacco are found as follows

Sample I	24	27	24	23	25	
Sample II	29	30	28	31	22	34

Can it be considered as samples from same normal population with equal variance.

17. Explain independence of attributes.
18. Explain median test.

19. The following data pertains to 6 samples of bolts tested for hardness.

Sample No.	Hardness rating			
1	47.1	47.2	47.2	48.1
2	46.1	47.1	47.8	45.4
3	45.0	44.1	44.1	44.3
4	44.7	44.6	43.1	43.3
5	45.9	45.7	46.1	44.5
6	47.1	46.7	46.1	45.5

Calculate the control limits for averages and ranges and draw mean and range chart.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

20. (i) Define maximum likelihood estimator.State the properties of a maximum likelihood estimator.

(ii) Find the maximum likelihood estimator for
θ based on
n observations for the frequency function

$$f(x, \theta) = \begin{cases} (1 + \theta)x^{\theta}; \theta > 0, 0 < x < \theta \\ 0 \ elsewhere \end{cases}$$

21. The following table gives the monthly sales (in thousand rupees) of a certain firm in three different states by four different salesmen.

States/Salesmen	W	X	Y	Z
A	10	8	8	14
B	14	16	10	8
C	18	12	12	14

(1 × 10 = 10 Marks)

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