C 3573 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2021

Statistics

STA 4C 03—STATISTICAL TECHNIQUES FOR GEOGRAPHY

Time : Two Hours Maximum : 60 Marks

Section A

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. Define null and alternative hypothesis.
2. What are the uses of Chi-square test ?
3. Define one tailed and two tailed test.
4. What are the advantages of non-parametric test ?
5. Define Quadrat analysis.
6. What is 'Analysis of Variance' ?
7. Explain the term 'critical region' of a statistical hypothesis.
8. What are the assumptions of sign test ?
9. What are the basic conditions for the application of Chi-square test of goodness of fit ?
10. Explain the concept of standard error.
11. State the assumptions of F test.
12. Explain the concept of spatial data.

(8 × 3 = 24 marks)

Section B

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. Explain Chi-square test of homogeneity.

14. The measurements of diameter of 8 cylindrical rods by vernier caliper and micrometer were as follows :

Vernier readings	2.265,	2.267,	2.264,	2.267,	2.268,	2.263,	2.264,	2.258
Micrometer reading :	2.270,	2.268,	2.269,	2.273,	2.270,	2.270,	2.268,	2.268

Test whether the difference between measurements of diameter by vernier caliper and micrometer is significant at 5 % level of significance.

15. Explain run test.

16. A sample of 900 members has a mean 3.4 cms and standard deviation 2.61 cms. Is the sample from a large population of mean 3.25 cms and standard deviation 2.61 cms at 5 % level of significance ?

17. Explain the F-test forequality of two population variances.

18. The demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained :

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
No. of parts demanded	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the days of the week at 5 % level of significance.

19. Write a short note on random and systematic point patterns.

(5 × 5 = 25 marks)

Section C

Answer any **one** *question.*
The question carries 11 *marks.*

20. Explain the two-way ANOVA.

21. Two researchers adopted different sampling techniques while investigating the same group of students to find the number of students falling in different intelligence levels.

Researcher	Number of students in each level				Total
	Below average	Average	Above average	Genius	
X	86	60	44	10	200
Y	40	33	25	2	100
Total	126	93	69	12	300

Would you say that the sampling techniques adopted by the two researchers are significantly different at 5% level of significance ?

(1 × 11 = 11 marks)

C 3572 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION APRIL 2021

Statistics

STA 4C 02—STATISTICAL TECHNIQUES FOR PSYCHOLOGY

Time : Two Hours Maximum : 60 Marks

Section A

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. State the null and alternative hypothesis of one-way ANOVA.
2. Write down the test statistic for Chi-square test for independence of attributes.
3. What are the advantages of non-parametric tests ?
4. Define main effect in factorial design.
5. Define the term Validity.
6. Stale the advantages of factorial design over simple experiment.
7. Define Sign test.
8. What do you mean by pilot survey ?
9. Define the model for two-way ANOVA.
10. What are the qualities of a good questionnaire ?
11. What is the test statistic for Wilcoxon Rank Sum Test ?
12. What is meant by ratio scale ?

(8 × 3 = 24 marks)

Section B

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. Define Critical difference. Explain it in the context of one-way classified data.

14. Explain Chi-square test for goodness of fit.

15. Define the term scale of measurements. What are the different scales of measurements ? Briefly explain each scale of measurements.

16. A simple random sample of 600 people who saw a movie at a theater are studied. The frequency of people with selected movie type and whether or not snacks were purchased are given below. Test whether the movie type is depended on whether or not snacks were purchased at 5 % level of significance.

Type of Movie	*Snacks*	*No Snacks*
Action	50	75
Comedy	125	175
Family	90	30
Horror	45	10

17. Explain the procedure of Kruskal Wallis Test.

18. The following two samples of measurements are obtained from sampling populations X and Y :

    Population X : 31, 19, 22,26, 15, 18, 36, 30, 29, 34, 33, 26, 19, 19, 26, 28, 31, 30

    Population Y : 35, 14, 19, 30. 8, 14, 34, 28, 23, 24, 27, 28, 20, 21, 21, 26.

    Use Run test to check the hypothesis at 5 % level of significance that two populations have identical distribution functions.

19. Briefly explain the reliability and validity of test scores.

(5 × 5 = 25 marks)

Section C

Answer any **one** *question.*
The question carries 11 *marks.*

20. The following figures related to the number of units sold in five different areas by four salesmen :

Area	*Number of Units*			
	A	B	C	D
1	80	100	95	70
2	82	110	90	75
3	88	105	100	82
4	85	115	105	88
5	75	90	80	65

Is there any significant difference at 5% level of significance in the efficiency of these salesmen? Compare the efficiency of salesmen using critical difference.

21. (a) Define Analysis of variance. Explain two way ANOVA test procedure with ANOVA Table.

(b) Explain 2^2 factorial experiment with an example.

(1 × 11 = 11 marks)

C 3571-A (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION, APRIL 2021

Statistics

STA 4C 04—STATISTICAL INFERENCE AND QUALITY CONTROL

(Multiple Choice Questions for SDE Candidates)

Time : 15 Minutes	Total No. of Questions : 20	Maximum : 20 Marks

INSTRUCTIONS TO THE CANDIDATE

1. This Question Paper carries Multiple Choice Questions from 1 to 20.
2. The candidate should check that the question paper supplied to him/her contains all the 20 questions in serial order.
3. Each question is provided with choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and enter it in the main answer-book.
4. The MCQ question paper will be supplied after the completion of the descriptive examination.

STA 4C 04—STATISTICAL INFERENCE AND QUALITY CONTROL

(Multiple Choice Questions for SDE Candidates)

1. Branch of statistics which study the unknown aspects of a population distribution is :

   (A) Estimation. (B) Hypothesis testing.

   (C) Inferential statistics. (D) Descriptive statistics.

2. Which of the following is not an assumption of parametric inference methods ?

   (A) Data is quantitative. (B) Population has a known distribution.

   (C) Sample is sufficiently large. (D) Data is qualitative.

3. Factorisation theorem for sufficiency is known as :

   (A) Rao-Blackwell Theorem. (B) Fisher-Neymann Theorem.

   (C) Cramer-Rao Theorem. (D) Neymann-Pearson Theorem.

4. For two unbiased estimators T_1 and T_2, if $V(T_1) > V(T_2)$, then :

   (A) T_1 is more efficient than T_2. (B) T_2 is more efficient than T_1.

   (C) T_1 and T_2 are equally efficient. (D) None of the above.

5. For a normal population, $\left[\overline{X} - z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}, \overline{X} + z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}\right]$ is the confidence interval for μ when :

   (A) σ is known. (B) σ is unknown and n is large.

   (C) σ is unknown and n is small. (D) Both (A) and (B).

6. For a normal population, $\left[\overline{X} - z_{\frac{\alpha}{2}} \frac{S}{\sqrt{n}}, \overline{X} + z_{\frac{\alpha}{2}} \frac{S}{\sqrt{n}}\right]$ is the confidence interval for μ when :

   (A) σ is known. (B) σ is unknown and n is large.

   (C) σ is unknown and n is small. (D) Both (A) and (B).

7. For a normal population, $\left[\overline{X} - t_{n-1,\frac{\alpha}{2}} \frac{S}{\sqrt{n}}, \overline{X} + t_{n-1,\frac{\alpha}{2}} \frac{S}{\sqrt{n}}\right]$ is the confidence interval for μ when :

(A) σ is known.
(B) σ is unknown and n is large.
(C) σ is unknown and n is small.
(D) Both (A) and (B).

8. The fixed level of P(Type I error) is called :

(A) Power of the test.
(B) Level of significance.
(C) Both (A) and (B).
(D) Neither (A) nor (B).

9. Among all the tests whose size is less than or equal to α the one for which β is minimum is called one for which :

(A) Most powerful test.
(B) Best test.
(C) Both (A) and (B).
(D) Neither (A) nor (B).

10. Sensitiveness of the test is given by :

(A) α.
(B) $1 - \alpha$.
(C) β.
(D) $1 - \beta$.

11. The value of the test statistic which separates the critical region and acceptance region is called :

(A) Test statistic value.
(B) Level of significance.
(C) Critical value.
(D) None of the above.

12. The critical region for χ^2-test for goodness of fit is :

(A) $\chi^2 > \chi^2_{\alpha}$.
(B) $\chi^2 < \chi^2_{\alpha}$.
(C) $\chi^2 > \chi^2_{\frac{\alpha}{2}}$.
(D) $\chi^2 < \chi^2_{\frac{\alpha}{2}}$.

13. The degrees of freedom corresponding to a χ^2-test independence of attributes having 3 rows and 4 columns is :

(A) 12.
(B) 7.
(C) 6.
(D) 5.

14. Analysis of variance is used for testing :

(A) Two population variances. (B) Two or more population variances.

(C) Two population means. (D) Two or more population means.

15. Controlling the quality of the product by critical examination at strategic points is achieved through :

(A) Control charts. (B) Specification Limits.

(C) Sampling Inspection Plans. (D) Tolerance Limits.

16. Control chart consists of :

(A) Three control lines. (B) Upper and lower control limits.

(C) The level of the process. (D) All the above.

17. Which among the following is not a control charts for attributes ?

(A) R chart. (B) *p* chart.

(C) *d* chart. (D) *c* chart.

18. Control chart for number of defective is called :

(A) $\overline{X}$ chart. (B) *p* chart.

(C) *d* chart. (D) *c* chart.

19. Control chart for number of defects is called :

(A) $\overline{X}$ chart. (B) *p* chart.

(C) *d* chart. (D) *c* chart.

20. A production process is said to be in a state of statistical control, if it is governed by :

(A) Chance cause alone. (B) Assignable cause alone.

(C) Both (A) and (B). (D) Neither (A) nor (B).

C 3571 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION, APRIL 2021

Statistics

STA 4C 04—STATISTICAL INFERENCE AND QUALITY CONTROL

Time : Two Hours Maximum : 60 Marks

Use of calculator and Statistical table are permitted.

Section A (Short Answer Type Questions)

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. Define point estimation.
2. Show that for random sample of size n taken from Poisson population, sample mean is an unbiased estimator of population mean.
3. Define sufficient estimator.
4. Define simple and composite hypothesis.
5. Define p-value.
6. State Neyman-Pearson Lemma.
7. How the degree of freedom of Chi-square statistic is decided in the test of goodness of fit ?
8. State the assumptions underlying in ANOVA.
9. Write a short note on run test.
10. What are the merits and demerits of non-parametric tests ?
11. Define process and product control.
12. Write a note on the trends in a process.

(8 × 3 = 24 marks)

Section B (Short Essay/Paragraph Type Questions)

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. Define a consistent estimator. State and prove sufficient conditions for a consistent estimator.

Turn over

14. Define confidence coefficient. Derive a 100 $(1 - \alpha)$% confidence interval for the variance of a normal population $N(\mu, \sigma^2)$ based on a random sample of size n, when the population mean is also unknown.

15. Find the power and size of the test, if $x \geq 0.8$ is the critical region for testing $H_0 : \theta = 2$ against $H_1 : \theta = 1$ based on a single observation from the population with p.d.f. $f(x, \theta) = \frac{1}{\theta}, 0 \leq x \leq \theta$.

16. The difference in scores obtained by two players in 11 games are as follows : –17, –10, –10, –8, –14, –16, –6, –1, –2, 9, 2. Use paired t-test to test whether the performance of the two players are same on their average scores at 5% level of significance.

17. Explain the procedures of Wilcoxon Signed Rank Test.

18. Explain control chart, CL, LCL and UCL.

19. Write a short note on c-chart.

(5 × 5 = 25 marks)

Section C (Essay Type Questions)

Answer any **one** *question.*
The question carries 11 *marks.*

20. Explain the various method of estimation. Obtain the MLE and Moment estimator of the mean of a normal population based on a sample of size n taken from that population.

21. The following are the number of units of an item sold by various salesmen in 5 different areas. Use one-way ANOVA to test the equality of the efficiency of the salesmen based on their average sale volume at 5% level of significance.

Area	Sale volume in units			
	A	B	C	D
1	80	100	95	70
2	82	110	90	75
3	88	105	100	82
4	85	115	105	88
5	75	90	80	65

(1 × 11 = 11 marks)

C 3570 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION, APRIL 2021

Statistics

STA 4B 04—TESTING OF HYPOTHESIS

Time : Two Hours and a Half Maximum : 80 Marks

Use of Calculator and Statistical table are permitted.

Section A (Short Answer Type Questions)

Answer at least **ten** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 30.

1. Define Statistical hypothesis.
2. Define size and critical region of a test.
3. Calculate the size of the test where a single observation, $x > 0.9$ is the rejection region for null hypothesis, $H_0 : \theta = 2$ for the population with p.d.f. $f(x,\theta) = \frac{1}{\theta}, 0 \le x \le \theta$.
4. State Neyman-Pearson Lemma.
5. Define SPRT.
6. Define Standard error.
7. What are the test statistics in a large sample test of the mean of a population when the population variance is (a) known ; and (b) unknown ?
8. Write the test statistic and its probability distribution in a small sample test of equality of means of two normal populations when population variances are unknown but assumed same.
9. Discuss the null hypothesis considered in a one-way ANOVA.
10. What is the F-statistic in the test of equality of variances of two normal populations ?
11. Differentiate one tailed and two tailed statistical tests.
12. Identify the degrees of freedom of a Chi-square statistic deals with a 3 × 4 contingency table.
13. Define run in a sequence of symbols.
14. What is a median test ?
15. How Kruskal Wallis test related to ANOVA ?

(10 × 3 = 30 marks)

Turn over

Section B (Short Essay/Paragraph Type Questions)

Answer at least **five** *questions.*
Each question carries 6 *marks.*
All questions can be attended.
Overall Ceiling 30.

16. Explain various steps involved in a statistical testing procedure.

17. In a coin tossing experiment, let p be the probability of getting a head. A coin is tossed 12 times to test the hypothesis $H_0 : p = 0.5$ against the alternative $H_1 : p = 0.7$, where p is the probability of getting head when the coin is tossed. Reject H_0, if more than 8 heads tossed out of the 12 tosses. Find significance level and power of the test.

18. A die with numbers 1 to 6 each written on their six faces was thrown 9000 times and the sides with numbers 5 or 6 appeared 3240 times. Can the die be considered as unbiased at 5% level of significance ?

19. Explain test of hypothesis for correlation co-efficient.

20. The average life of dry cells is claimed as 24 hours. A sample of 10 dry cells produced an average life length of 22.5 hours with a SD 3 hours. Test whether the claim is correct at 5% level of significance.

21. The following result obtained on a study on vaccination against a disease.

	Affected	Unaffected
Vaccinated	12	26
Not-vaccinated	16	6

Examine the effect of vaccine to control the disease at 5% significance level.

22. Explain the advantages and disadvantages of non-parametric tests.

23. Explain Mann-Whitney U test.

(5 × 6 = 30 marks)

Section C (Essay Type Questions)

Answer any **two** *questions.*
Each question carries 10 *marks.*

24. (i) Explain the large sample test of equality of proportions of two populations.

(ii) In a sample of 600 men from a certain city, 450 men are found to be smokers and a sample of 900 from another city, 450 are found to be smokers. Do the data indicate that the two cities differ significantly in smoking habit of men at 5% level of significance ?

25. For the following two sets of observations taken from two normal populations, test whether the population means are same at 5% level of significance.

Set I : 10, 6, 16, 17, 13, 12, 8, 14, 15, 9

Set II : 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17

26. (i) Explain Chi-square test of goodness of fit.

(ii) A dice is tossed 120 times with the following result :

Number shown	1	2	3	4	5	6
Frequency	30	25	18	10	22	15

Test whether the dice is unbiased at 5% level of significance.

27. Explain : (i) Kolmogorov-Smirnov test ; and (ii) test for randomness.

(2 × 10 = 20 marks)

C 2238 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
APRIL 2021

Statistics

SG 4C 04—TESTING OF HYPOTHESIS

Time : Three Hours Maximum : 80 Marks

Use of calculator and statistical tables are permitted.

Part A

Answer **all** *questio* 1 *mark.*

1. The hypothesis which is to be tested for it's possible rejection is ————————.
2. The range of χ^2-variate is ————————.
3. ANOVA technique is used to test the equality of ————————.
4. Degrees of freedom of Chi-square in case of contingency table of order (6 × 3) are ————————
5. The statistic involved in testing several population means is ————————.
6. Abbreviated form of analysis of variance is ————————.
7. The hypothesis $H_0 : \theta = \theta_0$ is a ———————— hypothesis.
8. The complementary probability of type II error is ————————.
9. Student's t-test was introduced by ————————.
10. To test the randomness of a sample, the appropriate test is ————————.

(10 × 1 = 10 marks)

Part B

Answer **all** *questions in one sentence.*
Each one carries 2 *marks.*

11. Define a statistical hypothesis with an example.
12. State the basic assumptions of ANOVA model.

13. Define critical region and its role in hypothesis testing.

14. What is a contingency table ? Give the χ^2 statistic for a 2×2 contingency table.

15. Define sampling distribution and standard error.

16. What are the assumptions associated with the non-parametric tests ?

17. Explain sign test.

(7 × 2 = 14 marks)

Part C

Answer any **three** *questions.*
Each one carries 4 *marks.*

18. Briefly explain the steps in solving testing of hypothesis problem.

19. Define simple and composite hypothesis with examples.

20. Distinguish between large sample and small sample tests.

21. Explain the test of significance for difference of means.

22. Using appropriate non-parametric test, test whether the following observations are randomly selected or not :

    15, 17, 1, 65, 69, 69, 58, 41, 81, 16, 16, 20, 0, 84, 22, 28, 26, 46, 66, 36, 86, 66, 17, 34, 49, 85, 45, 51, 40, 10.

(3 × 4 = 12 marks)

Part D

Answer any **four** *questions.*
Each one carries 6 *marks.*

23. Use χ^2 test to determine if stature of sons are independent of stature of fathers. $\left(\chi^2_{0.05,1} = 3.841\right)$

		Stature of fathers	
Stature of sons		Tall	Short
	Tall	8	2
	Short	7	6

24. Complete the following one-way ANOVA table :

Source	df	SS	MS	F
Between groups	—	—	82.825	—
Error	15	95.25	—	
Total	19	—		

25. Explain any *two* large sample tests.

26. Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis that the true variances are equal, against the alternative that they are not at 10 % level.

27. Explain Wilcoxon's signed rank test.

28. A random sample of 10 boys had the following I.Q.'s : 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100 ?

(4 × 6 = 24 marks)

Part E

Answer any **two** *questions.*
Each one carries 10 *marks.*

29. Perform a two-way ANOVA on the data given below :

Sides of triangle	Measurements by pupils				
	A	B	C	D	E
A	5.4 4	5.4 1	5.4 3	5.4 2	5.4 3
B	5.4 3	5.4 1	5.4 2	5.4 3	5.4 4
C	5.4 5	5.4 2	5.4 3	5.4 3	5.4 4

30. Explain Chi square test for independence of attributes.

31. A survey of 320 families with 5 children each revealed the following distribution :

No. of boys	5	4	3	2	1	0
No. of girls	0	1	2	3	4	5
No. of families	14	56	110	88	40	12

Is this result consistent with the hypothesis that male and female births are equally probable ?

32. Discuss in detail one way and two way ANOVA.

(2 × 10 = 20 marks)

C 2237-A (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, APRIL 2021

Statistics

STS 4C 04—APPLIED STATISTICS

(Multiple Choice Questions for SDE Candidates)

Time : 15 Minutes	Total No. of Questions : 20	Maximum : 20 Marks

INSTRUCTIONS TO THE CANDIDATE

1. This Question Paper carries Multiple Choice Questions from 1 to 20
2. The candidate should check that the question paper supplied to him/her contains all the 20 questions in serial order.
3. Each question is provided with choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and enter it in the main answer-book.
4. The MCQ question paper will be supplied after the completion of the descriptive examination.

STS 4C 04—APPLIED STATISTICS

(Multiple Choice Questions for SDE Candidates)

1. A study based on complete enumeration is known as :

   (A) Sample Survey. (B) Pilot survey.

   (C) Census survey. (D) None of the above.

2. Sampling frame refers to :

   (A) The number of items in the sample.

   (B) The number of items in the population.

   (C) Listing of all items in the population.

   (D) Listing of all items in the sample.

3. 'Enumerators are persons :

   (A) Who conducts the investigation ? (B) Who gathers the information from informants ?

   (C) Who gives the information ? (D) None of the above.

4. Selected units of a systematic sample are :

   (A) Not easily locatable.

   (B) Easily locatable.

   (C) Not representing the whole population.

   (D) All the above.

5. Which of the following is a mixed sampling method ?

   (A) Stratified random sampling. (B) Systematic sampling.

   (C) Cluster sampling. (D) All the above.

6. Equality of two population variances can be tested by :

   (A) t-test. (B) F-test.

   (C) Both (A) and (B). (D) Neither (A) nor (B).

7. The ratio of between sample variance and with in sample variance follows :

   (A) F-Distribution. (B) χ^2-Distribution.

   (C) Z-Distribution. (D) t-Distribution.

8. Analysis of variance utilizes :

(A) F-test.
(B) χ^2-test.
(C) Z-test.
(D) t-test

9. The error degrees of freedom for two-way ANOVA with r rows and c columns is :

(A) $r - 1$.
(B) $c - 1$.
(C) $(r - 1)(c - 1)$.
(D) $rc - 1$.

10. The technique of Analysis of variance was first devised by :

(A) Karl Pearson.
(B) R.A. Fisher.
(C) Irwing Fisher.
(D) W.Z. Gosset.

11. Index numbers help :

(A) In framing of economic policies.
(B) In assessing the purchasing power of money.
(C) For adjusting national income.
(D) All the above.

12. Laspeyre's index formula uses the weight of the :

(A) Base year.
(B) Current year.
(C) Average of the weights of a number of years.
(D) None of the above.

13. The weights used in Paasche's formula belong to:

(A) The base period.
(B) The given period.
(C) To any arbitrary chosen period.
(D) None of the above.

14. The condition for the time reversal test to hold good with usual notations is :

(A) $p_{01} \times p_{10} = 1$.
(B) $p_{10} \times p_{01} = 0$.
(C) $p_{01} / p_{10} = 1$.
(D) $p_{01} + p_{10} = 1$.

15. Laspeyre's index number is also known as :

(A) Fixed base index.
(B) Given year method index.
(C) Base year method index.
(D) None of the above.

16. Chance variation in respect of quality control of a product is :

(A) Tolerable.
(B) Not effecting the quality of a product.
(C) Uncontrolable.
(D) All the above.

17. The faults due to assignable causes :

(A) Can be removed.
(B) Cannot be removed.
(C) Can sometimes be removed.
(D) All the above.

18. The relation between expected value of R and S.D. σ with usual constant factors is :

(A) $E(R) = d_1\sigma$.
(B) $E(R) = d_2\sigma$.
(C) $E(R) = D_1\sigma$.
(D) $E(R) = D_2\sigma$.

19. The trial control limits for R-chart with usual constant factors are

(A) U.C.L. = D_4R, C.L. = $\bar{R}$ and L.C.L. = D_3R.
(B) U.C.L. = $D_4\bar{R}$, C.L. = $\bar{\bar{R}}$ and L.C.L. = $D_3\bar{R}$.
(C) U.C.L. = $D_4\bar{R}$, C.L. = $\bar{\bar{R}}$ and L.C.L. = $D_4\bar{R}$.
(D) All the above.

20. If μ and σ are the process mean and S.D., then the control limits $\mu \pm 3\sigma$ are known as

(A) Modified control limits.
(B) Natural control limits.
(C) Specified control limits.
(D) None of the above.

C 2237 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER (CUCBCSS–UG) DEGREE EXAMINATION, APRIL 2021

Statistics

STS 4C 04—APPLIED STATISTICS

Time : Three Hours Maximum : 80 Marks

Use of Calculator and Statistical table are permitted.

Part A

Answer **all** *questions in one word.*
Each question carries 1 *mark.*

1. The data collected from published reports is known as ———— data.
2. If all the units of a population are surveyed, it is called ————.
3. The number of all possible samples of size 2 from a population of 4 units is ————.
4. The ratio of between sample variance and within sample variance follows ———— distribution.
5. A time series is a set of values arranged in ———— order.
6. For additive model, the sum of the seasonal indices is ————.
7. Index numbers are expressed in ————.
8. If μ and σ are the process mean and standard deviation, then the control limits $\mu \pm \sigma$ are known as ————.
9. The probability of rejecting a lot having $\bar{p}$ as the process average defectives is known as ————.
10. The points which lie outside the upper control line are called ————.

(10 × 1 = 10 marks)

Part B

Answer **all** *questions in one sentence.*
Each question carries 2 *marks.*

11. Define primary data.
12. Define population.
13. Give the basic assumptions in ANOVA technique.
14. Discuss the multiplicative model of a time series.
15. Give the names of different methods of measuring trend.

16. Discuss time reversal test.

17. What is the main purpose of statistical quality control ?

(7 × 2 = 14 marks)

Part C

Answer any **three** *questions.*
Each question carries 4 *marks.*

18. Distinguish between census and sampling. What are the merits of sampling over census ?

19. What are the advantages and disadvantages of the moving average method ?

20. Discuss various problems involved in the construction of index numbers.

21. Distinguish between Laspeyre's and Paasche's index numbers.

22. How is the control limits set up for mean ?

(3 × 4 = 12 marks)

Part D

Answer any **four** *questions.*
Each question carries 6 *marks.*

23. Explain the technique of analysis of variance for a one-way classification data.

24. Explain the methods for collecting primary data.

25. Calculate the Laspeyer's index number from the following data :

Commodity	Price		Quantity	
	Base year	Current year	Base year	Current year
A	0.80	0.70	10	11
B	0.85	0.90	8	9
C	1.30	0.80	5	5.5

26. Apply the method of semi-averages for determining the trend.

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Value	45	58	62	50	70	72	68	70	78	75

27. Discuss the method of least squares in fitting a straightline trend.

28. What do you understand by control limits in statistical quality control ?

(4 × 6 = 24 marks)

Part E

Answer any **two** *questions.*
Each question carries 10 *marks.*

29. Explain the problems in the construction of index numbers.

30. Compute Fisher's ideal index from the following data and show that it satisfies the factor reversal test.

Commodity	Price		Quantity	
	Base year	Current year	Base year	Current year
A	5	8	10	1
B	6	24	18	3
C	8	11	8	1
D	3	12	6	4

31. How will you prepare the control charts for fraction defectives ?

32. Following are the weekly sale records (in Rs.) of three salesmen A, B and C of a company during 13 sale-calls :

A	300	400	300	500	
B	600	300	300	400	
C	700	300	400	600	500

Test whether the sales of three salesmen are different.

(2 × 10 = 20 marks)

C 2236 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, APRIL 2021

Statistics

STS 4B 04—TESTING OF HYPOTHESIS

Time : Three Hours Maximum : 80 Marks

Part A (One Word Questions)

Answer **all** *questions.*
Each question carries 1 *mark.*

1. Level of significance is the probability of ————.
2. Neymann-Pearson lemma provides ————.
3. A statistical hypothesis which specifies the values of parameters is called ————.
4. The degrees of freedom for statistic-t for paired t-test based on n pairs of observations is ————.
5. The hypothesis $H_0 : \theta = \theta_0$ is a ———— hypothesis.
6. Type ———— error is more severe than type ———— error.
7. A hypothesis contrary to null hypothesis is known as ————.
8. The number of independent values in a set of values is known as ————.
9. Kolmogorov-Smirnov test is based on ———— theorem.
10. The number of runs in the sequence $\alpha\alpha\beta\beta\beta\alpha\alpha\alpha\beta\alpha\beta$ is ————.

(10 × 1 = 10 marks)

Part B

Answer **all** *questions in* **one sentence.**
Each question carries 2 *marks.*

11. Define null and alternative hypothesis.
12. Define uniformly most powerful test of size α .
13. What is an unbiased test ?
14. Write any two applications of Student's t-test in testing problems.
15. What is a contingency table ?

16. A random sample of 400 items drawn from a normal population with standard deviation 2 is found to be a mean of 4.5. Can it be regarded as the population mean is exactly equal to 4 or not ?

17. Define critical region and its role in hypothesis testing.

(7 × 2 = 14 marks)

Part C

Answer any **three** *questions.*
Each question carries 4 *marks.*

18. Explain the errors in testing of hypothesis.

19. A random sample of 60 observations are selected from a Poisson population with parameter λ. To test $H_0 : \lambda = 1$ against $H_1 : \lambda = 2$, the hypothesis is rejected if $\{\overline{X} \geq 4\}$. Find the level and power of the test.

20. Explain the general procedure for large sample tests.

21. Explain Run test.

22. Compare Chi-square and Kolmogorov-Smirnov tests for goodness of fit.

(3 × 4 = 12 marks)

Part D

Answer any **four** *questions.*
Each question carries 6 *marks.*

23. For a one-sided testing problem define : (i) size of a test ; (ii) power function of a test ; (iii) UMP test ; and (iv) UMPU tests.

24. Find the best critical region to test $H_0 : p = p_0$ against $H_1 : p = p_1$ based on a random sample of size 'k' from B(n,p) for a given 'n'.

25. State and prove Neymann-Pearson lemma.

26. Explain the procedure of testing the equality of variances.

27. In a city 25% of a random sample of 900 school boys had defective eyesight. In another city 15.5% of a random sample of 1600 school boys had the same defect. Is the difference between proportions of defective eyesight differ significantly ?

28. Two random samples are selected from two continuous populations and the observations are as given below. Using U-test examine whether the observations are from same population or not.

Sample I	:	227	176	252	149	16	55	233	194	247	92	184	147	88	161	171
Sample II	:	202	14	165	171	292	271	151	235	147	99	63	284	53	228	271

(4 × 6 = 24 marks)

Part E

Answer any **two** *questions.*
Each question carries 10 *marks.*

29. Describe large sample tests. Explain the method of testing equality of two population means using large samples.

30. (i) Explain paired t-test.

(ii) In a certain experiment to compare two types of pig foods A and B following results of increase in weights are obtained :

Pigs		1	2	3	4	5	6	7	8
Increase in weights	Food A	49	53	51	52	47	50	52	53
	Food B	52	55	52	53	50	54	54	53

Can we conclude that food B is better than A ?

31. Explain sign tests and Wilcoxon signed rank test.

32. (i) Explain χ^2 test for independence of attributes.

(ii) The following table gives the hair colours of boys and girls in a university.

Hair colour		Fair	Red	Medium	Dark	Black
No. of Boys	:	592	119	849	504	36
No. of Girls	:	544	97	677	451	14

Examine whether hair colour is independent of sex ?

(2 × 10 = 20 marks)