2B5N22207

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Reg. No:.........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Statistics Degree Examination, November 2022

BST5B07 – Linear Regression Analysis

(2019 Admission onwards)

Time: 2 ½ hours

Max. Marks: 80

PART A
Each question carries 2 marks.

1. Write the mean and variance of the response variable of a simple linear regression model.

2. What are the uses of regression?

3. How does coefficient of determination help to interpret estimated linear regression model?

4. How do you interpret the slope coefficient in a simple linear regression model?

5. State Gauss- Markov theorem.

6. Write the covariance matrix of the multiple linear regression coefficients.

7. What is the advantage of adjusted R^2 over the coefficient of determination R^2?

8. Define hat matrix.

9. How does adjusted R^2 differ from R^2?

10. Write the assumptions of simple linear regression model.

11. Distinguish between residual and standardized residual.

12. Define PRESS residual. Write its variance.

13. Define splines and knots.

14. When do we say that the matrix becomes ill conditioned?

15. Define odds ratio in logistic regression.

Maximum Mark = 25

PART B
Each question carries 5 marks

16. Describe simple linear regression model. Write the assumptions associated with simple linear regression

17. Prove that mean residual sum of square is an unbiased estimator of the variance of the response variable.

18. Describe the t test for testing the significance of individual regression coefficients in multiple linear regression.

19. Write the least square estimates of multiple linear regression coefficients. Examine the unbiasedness of these estimates.

20. Derive the confidence interval for the parameters in a multiple linear regression model.

21. Define studentized residual. Derive its mean vector and covariance matrix.

22. Describe polynomial regression models.

23. Describe binary logistic regression model.

Maximum Mark = 35

PART C
Each question carries 10 marks (Answer any TWO Questions)

24. To investigate the effect of amount of money spent on research and development on the gross sales, an electronic firm recorded the data for last 12 years which is given below. Fit a linear regression model for the data and interpret the results.

Amount spent	2	4	7	6	3	3	7	8	6	6	5	6
Gross sales	3	4	4	5	5	4	4	4	5	6	3	6

25. Explain the maximum likelihood estimation of multiple linear regression coefficients.

26. How does the residual plots useful to examine the model adequacy of simple linear regression? Explain.

27. Explain the estimation of parameters of logistic regression model with binary response variable.

(2 × 10 = 20 Marks)

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Reg. No:...........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Statistics Degree Examination, November 2022

(Open Course)

BST5D03 – Basic Statistics

(2019 Admission onwards)

Time: 2 hours

Max. Marks: 60

Section-A
Each question carries two marks

1. What do you understand by a population in statistical sense ?

2. What is the need of sampling as compared to census ?

3. Define probability sampling.

4. The measure of peakedness or flatness of the frequency curves are called...........

5. Find the range of 5,15,11,12,8,9,12,11,10

6. Define standard deviation.

7. How to find the median when the no. of observation n is odd?

8. Define a scatter diagram.

9. What is meant by the principle of least squares.

10. Two dice are tossed. Find the probability of getting an even number on the first die or a total of 8

11. Define the classical definition of probability.

12. What do you mean by pairwise independence of events.

Maximum Marks = 20

Section-B
Each question carries five marks

13. Explain briefly the difference between sampling error and non sampling error.

14. Obtain the median for the following frequency distribution:

X	1	2	3	4	5	6	7	8	9
F	8	10	11	16	20	25	15	9	6

15. Define Arithmetic Mean. Find the mean of the distribution, in which the values of x are 1, 2, 3, ..., n and the frequency of each being unity.

16. Explain correlation with suitable example. How do you calculate Karl Pearson's Correlation.

17. Fit a straight line to the following data, by taking Y as the dependent variable.

X	1	2	3	4	5
Y	6	4	8	9	11

18. State and prove addition theorem of probability of two events.

19. Define frequency definition and axiomatic definition of probability.

Maximum Mark =30

Section-C
Answer *any one* question. Each question carries ten marks

20. Twenty five books are placed at random in a shelf. Find the probability that a particular pair of book shall be   i) Always together and   ii) never together

21. Calculate the correlation coefficient for the following heights (in inches) of fathers X and their sons Y

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

(1 x 10 = 10 marks)

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Reg. No:............................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Statistics Degree Examination, November 2022

BST5B06 – Sample Surveys

(2019 Admission onwards)

Time: 2 ½ hours

Max. Marks: 80

PART A

Each question carries 2marks.

1. What is finite population correction ?

2. What the term 'sample' implies ?

3. Explain probability sampling.

4. Explain Lottery method.

5. What is the variance of unbiased estimate of population mean in SRSWOR ?

6. Explain the terms: Parameter & estimate.

7. Define linear Systematic sampling.

8. Define secondary data.

9. Explain sampling error.

10. Describe simple random sampling of proportions.

11. Explain cluster sampling.

12. Explain 'precision of an estimate'?

13. Explain proportional allocation in Stratified sampling.

14. What are the basic principles of stratification ?

15. What are the limitations of sampling method ?

Maximum Mark = 25

PART B

Each question carries 5 marks

16. Explain the Neyman allocation in stratified sampling.

17. Describe Sampling Error, non- Sampling Error, primary data & secondary data.

18. Discuss simple random sampling (SRS) with and without replacement. Explain any method to select samples through SRS.

19. What are the advantages of sampling over census?

20. Explain non-probability sampling with the help of examples.

21. Obtain the variance of the sample proportion p at SRSWOR.

22. Explain the advantages of cluster sampling.

23. Find the sample size in each stratum under optimal allocation with fixed sample size.

Maximum Mark = 35

PART C

Each question carries 10 marks (Answer any TWO Questions)

24. Show that by usual notation, for sample mean- $V_{opt} \le V_{prop} \le V_{srs}$

25. Explain linear & circular systematic sampling. Obtain an unbiased estimator of population mean in systematic sampling. Find the variance of the sample mean from systematic sample.

26. Explain in detail the principal steps in a sample survey.

27. Find an unbiased estimate for population mean in

   i) Stratified random sampling ii) Systematic sampling. Check, which one is more efficient

(2 × 10 = 20 Marks)

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Reg. No:.........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Statistics Degree Examination, November 2022

BST5B05 – Mathematical Methods in Statistics

(2019 Admission onwards)

Time: 2½ hours

Max. Marks: 80

PART A
Each question carries 2 marks.

1. If $x, y \in R$, then show that $|x + y| \le |x| + |y|$.

2. State the order properties of R.

3. Give an example of a set which is bounded below but not bounded above.

4. Define absolute value of a real number.

5. Find the infima and suprema of the function $\frac{1+(-1)^n}{n}, n \in N$.

6. Define limit of a sequence.

7. Find $\lim_{x \to \infty} \frac{x^2}{e^x}$

8. Give an example of a function which is discontinuous everywhere on R.

9. What is the relationship between continuity and differentiability of a function?

10. Find the left hand derivative of the function $f(x) = \frac{|x-1|}{2}$ at $x = 1$?

11. State Taylor's theorem.

12. Define uniform continuity.

13. State Darboux's theorem.

14. Define Partition of an interval.

15. Define refinement of a partition.

Maximum Mark = 25

16. State and prove density theorem.

17. State and prove Monotone Convergence Theorem.

18. Show that the series $1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \cdots$ is convergent.

19. Show that the sequence (r^n) converges iff $-1 < r \leq 1$.

20. Verify Lagrange's Mean value Theorem for the following function:

$f(x) = x^2 - 3x + 5$ on $[1,3]$

21. Show that a function which is differential at a point is necessarily continuous at that point.

22. If a function f is monotonic on $[a, b]$, then show that it is integrable on $[a, b]$.

23. Show that a constant function k is integrable and $\int_a^b k\,dx = k(b - a)$.

Maximum Mark = 35

PART C
Each question carries 10 marks (Answer any TWO Questions)

24. Evaluate

(a) $\lim_{n \to \infty} \left(1 + \frac{1}{n+1}\right)^n$ (b) $\lim_{n \to \infty} \sqrt[n]{a}$, $a > 0$.

25. State and prove Cauchy's first theorem on limits.

26. a) Show that a function which is continuous on a closed interval is also uniformly continuous on that interval.

b) Examine the uniform continuity of the function $f(x) = \sin x^2$ on $[0, \infty)$.

27. State and Prove First Fundamental Theorem of Calculus.

(2 x 10 =20 Marks)