MAJOR & ELECTIVE COURSES

I Semester B.Sc. (CUFYUGP) Degree Examinations

STA1CJ101: Univariate Data Analysis

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks](Ceiling: 24 Marks)

1. Discuss the characteristics of time series data and cross-sectional data. Provide real-life examples of each.
2. Distinguish between nominal and ordinal data. Provide examples illustrating their differences.
3. Explain the concepts of geometric mean and harmonic mean.
4. Given two datasets with means 50 and 60, and standard deviations 5 and 10 respectively, compare their coefficients of variation.
5. Discuss R as a statistical software and programming language.
6. Compute the central moment of order 2 for the dataset: 4, 7, 9, 12, 15.
7. Explain the concepts of discrete and continuous data with suitable examples.
8. Calculate the skewness based on quartiles for the dataset: 20, 25, 30, 35, 40.
9. Given the dataset {10, 15, 20, 25} with respective weights {2, 3, 4, 5}, calculate the weighted mean.
10. If the kurtosis of a dataset is -0.5, interpret its distribution in terms of peakedness and tails.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

Value	10	15	20	25	30
Frequency	5	8	10	6	4

11. Given the frequency distribution table, Calculate the arithmetic mean for the given data.
12. Compute the quartiles (Q1, Q2, Q3) for the dataset: 12, 15, 18, 21, 24, 27, 30, 25, 12, 34 . Then, calculate the quartile deviation.
13. Explain the procedures for saving, storing, and retrieving work in R.
14. Describe the process of designing a questionnaire for primary data collection. What are the key considerations in questionnaire design?
15. Discuss the calculation and interpretation of the median and mode. Provide scenarios where each measure is appropriate.
16. Explain the methods of data inputting in R, including direct input and importing from other spreadsheet applications like Excel.
17. Discuss the role of graphics in R.
18. Explain Box Plot and Interpret the box plot in terms of median, quartiles, and outliers for the dataset: 10, 12, 15, 20, 30, 35, 50.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Compare the measures of central tendency (mean, median, mode) in different scenarios. Discuss the robustness of each measure.

Value	10	15	20	25	30
Frequency	2	8	3	6	2

20. Given the frequency distribution table, Calculate the standard deviation for the given data.

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2CJ101(P) Bivariate Data Analysis (credits: 4)

Maximum Time: 2 hours Maximum Marks: 70

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define a Contingency Table.
2. State the Principle of Least Squares.
3. Define Correlation.
4. Define Discordant and Concordant pairs.
5. Define Biserial Correlation.
6. Define Regression.
7. Distinguish between Correlation and Regression.
8. State the necessity of creating two lines of Regression.
9. State properties of Regression coefficients.
10. Comment on the nature of Regression lines in the case of perfect and zero Correlation.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Define Scatter Diagram. Explain how Scatter Diagram is used to assess type and kind of Correlation?
12. Fit a straight line to the following data.

X	10	12	14	16	18	20	22
Y	56	61	66	69	72	75	78

13. Show that the Coefficient of Correlation is always bounded by -1 and +1.
14. Explain the Joint and Marginal frequencies.
15. Explain how concordant and discordant pairs are used in assessing Correlation.
16. The following data gives ranks given by two judges in a competition

Judge 1	4	9	2	1	5	7	6	3	8	10
Judge 2	6	7	4	2	8	10	3	1	5	9

Compute Rank Correlation Coefficient and comment on the correlation.

17. Show that Correlation coefficient is the GM of two Regression Coefficients.
18. In a Regression analysis the two lines of Regression were

$2X + 8Y = 25$ and $6X + 3Y = 32$. Find the Coefficient of Correlation and AM of two variables.

MAJOR & ELECTIVE COURSES

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Fit an exponential curve Y = ab^x to the following data

X	1	2	3	4	5	6
Y	80	64	52	44	32	25

20 The following date gives the yield of wheat(Y) corresponding to various levels of fertilization (X)

X in grams	100	120	140	160	180	200
Y in kilograms	58	62	64	67	70	72

1. Compute the Karl Pearson's Correlation Coefficient
2. The lines of Regression
3. Estimate Yield when fertilization used is 150 grams.

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II Semester B.Sc. (CUFYUGP) Degree Examinations

STA3CJ201 Mathematical Methods for Statistics I
(credits: 4)

Maximum Time: 2 hours Maximum Marks: 70

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define the completeness property of real numbers.
2. Show that $||a| - |b|| \leq |a - b|$.
3. Discuss the significance of the Nested Intervals Property in real analysis.
4. Discuss the Uncountability of real numbers.
5. State the Bolzano-Weierstrass Theorem.
6. State the Monotone Convergence Theorem.
7. Explain the concept of a continuous function.
8. State Bolzano's Intermediate Value Theorem.
9. Explain the difference between continuous function and uniform continuous function.
10. Define the Riemann integral of a function.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Prove that if a sequence is bounded and monotonic, then it converges.
12. State and Prove the density theorem.
13. Explain the Chain Rule for differentiation.
14. Let I be a closed bounded interval and let $f: I \rightarrow R$ be continuous on I. Then f is uniformly continuous on I.

15. Prove that every monotone function on a closed interval is Riemann integrable.
16. Discuss the convergence of the series: $\sum_{n=1}^{\infty} \frac{1}{n^2}$.
17. Prove the Cauchy Criterion for convergence of sequences.
18. There does not exist a rational number r such that r^2 = 2.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Show that there exists a positive real number x such that x^2 = 2.
20. Show that a continuous function on a closed interval attains its maximum and minimum.

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III Semester B.Sc. (CUFYUGP) Degree Examinations

STA3CJ202 Probability and Random Variables

(credits: 4)

Maximum Time: 2 hours Maximum Marks: 70

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

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Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

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Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.
20.

MAJOR & ELECTIVE COURSES

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IV Semester B.Sc. (CUFYUGP) Degree Examinations

STA4CJ201 Probability Distributions

(Credits: 4)

Maximum Time: 2 hours **MaximumMarks: 70**

Section A [AnswerAll.Eachquestioncarries3marks] (Ceiling: 24 Marks)

1. Explain Discrete and Continuous random variables.
2. Explain the Exponential family of Distributions with example.
3. Find the Expectation of Poisson distribution
4. What is Hazard function
5. Explain Rectangular Distribution
6. Describe Reliability Function
7. Write the properties of Normal Distribution
8. Find the parameters of the Binomial Distribution, if the mean = 50 and SD = 5.
9. Explain Hyper-Geometric Distribution
10. Explain Weibull Distribution

Section B
[AnswerAll.Eachquestioncarries6 marks] (Ceiling: 36Marks)

11. Write the MGF of Poisson distribution and Find the mean and SD.
12. Find the recurrence relation of Central moments of Normal Distribution.
13. Explain Lognormal Distribution, Pareto Distribution, and Cauchy Distribution.
14. Find the Reliability Function of Exponential Distribution and Uniform Distribution
15. Explain Gamma Distribution. Find the mean of the distribution.
16. Find the Hazard function of Geometric Distribution.
17. Explain Beta I and Beta ll Distributions.
18. Show that Normal Distribution is a limiting case of Binomial Distribution.

Section C
[Answeranyone.Eachquestioncarries10 marks] (1x10=10marks)

19. Explain Poisson Distribution. Show that Poisson distribution is a limiting case of Binomial Distribution.
20. The final exam scores in a statistics class were normally distributed with a mean of 63 and a standard deviation of 5. Find the probability that a randomly selected student scored a) more than 65 b) less than 60 c) between 58 & 68 d) between 50 and 60 d) less than 50 on the exam.

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MAJOR & ELECTIVE COURSES

IV Semester B.Sc. (CUFYUGP) Degree Examinations

STA4CJ202 Bivariate RV's and Limit Theorems
(credits: 4)

Maximum Time: 2 hours Maximum Marks: 70

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

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Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

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Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.

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MAJOR & ELECTIVE COURSES

III Semester B.Sc. (CUFYUGP) Degree Examinations

STA3CJ203 Applied Statistics Time Series, Index Numbers & Official Statistics

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.What is a time series? Write two example of time series.

2.Explain secular trend and seasonal variation with examples.

3. The sales of a commodity, in tonners, vaeied from January 1995 to December 1995 as under:

280	300	280	280	270	240	230	230	220	200	210	200

Fit a trend line by the method of semi averages

4. Distinguish between ratio to trend and ratio to moving average methods of measuring seasonal variations

5.. Define price index number.

6. Distinguish between simple and weighted index numbers

7. Explain the method of constructing cost of living Index number.

8. What are the criteria of a good index number

9. What is meant by vital statistics?

10. Explain

(i) Crude mortality rates

(ii)Age specific mortality rates and

(iii) Standardized mortality rates.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Wtite down the normal equations for fitting (i) parabola (ii) exponential curve.

12. The following table relates to the tourist arrivals (in millions) during 2014 to 1996 in India:

Year:	2014	2015	2016	2017	2018	2019	2020
Tourists rrivals:	18	20	23	25	24	28	30

Fit a straight line trend by the method of least squares and estimate number of tourists that would arrive in the year 2025

13. The data on prices (Rs in per kg) of a certain commodity during 1995 to 1999 are shown below.

Quarter	Years				
	1995	1996	1997	1998	1999
I	45	48	49	52	60
II	54	56	63	65	70

III	72	63	70	75	84
IV	60	56	65	72	66

Compute the seasonal index by the average percentage method and obtain the deseasonalised value.

14. Apply the method of link relatives to the following data and calculate seasonal indexes

Quarter	Years				
	1995	1996	1997	1998	1999
I	6	5.4	6.8	7.2	6.6
II	6.5	7.9	6.5	5.8	7.3
III	7.8	8.4	9.3	7.5	8
IV	8.7	7.3	6.4	8.5	7.1

15. Calculate consumer price index number for the following data

Commodity	Quantity	Base year price	Current year price
A	7	80	90
B	9	90	100
C	10	100	80
D	6	40	50

16. Compute Fisher's index number for the following data

Items	1981		1991	
	Price	Quantity	Price	Quantity
I	5	62	6	71
II	7	43	8	100
III	9	93	12	65

17.. (i) In a population of 183450 individuals in a year there were 5400 births and 4730 deaths. Calculate the crude Birth date and crude death rate.

(ii) The population of a locality at the 1982 was 838450. There were 11546 births and 8596 deaths in 1983. The number of immigrants was 87453 and the number of emigrants was 13576. Estimate the population at the end of 1983.

18. What are the methods of collection of vital statistics? Define age specific death rate.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Assume a four yearly cycle and calculate the trend by the method of moving average from the following data relating to the production of tea in India

Year:	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Production:	464	515	518	467	502	540	557	571	586	612

Also graph the observed values and trend values.

20. Describe the method of construction of life tables. Also explain the uses of the life tables.

MAJOR & ELECTIVE COURSES

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V Semester B.Sc. (CUFYUGP) Degree Examinations

STA5CJ301 Estimation

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A [Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Distinguish between statistic and Parameter.
2.What do you mean by sampling distribution?
3.What is the distribution of sample mean for a normal distribution?
4.What do you mean by point estimation?
5. When does the equality hold in the CR inequality?
6. Define complete family of distribution and state Lehmann Scheffe Theorem
7. Obtain an unbiased estimate of p in B(n, p)
8. Let $X_1, X_2 \dots \dots X_n$ be a random sample where $X_i \sim$ exponential(β), that is: f(x) = $\frac{1}{\beta} e^{-x/\beta}$,$x_i$ > 0 and 0 elsewhere Derive the MLE for β.
9. Define likelihood function
10. What is confidence interval?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11.Derive the mode of F Distribution. Also If X has an F distribution with n_1 *and* n_2 degrees of freedom., find the distribution of $\frac{1}{X}$.
12. Let $X_1, X_2 \dots \dots X_n$ be a random sample (i.i.d.) of size n from a population f(x) with mean μ and variance σ^2. Prove that E(S^2)= σ^2,whereS^2 is the sample variance.
13. Derive the mgf of a chi square distribution.
14.. Find the CR lower bound for the variance of an unbiased estimator of θ in sampling from N(θ,1).
15. Show that $\frac{\Sigma x_i(\Sigma x_i - 1)}{n(n-1)}$ is an unbiased estimate of θ^2, for the sample $x_1, x_2, \dots \dots x_n$ drawn on X and takes values 0 or 1 with respective probabilities θ and 1 - θ
16. Let $X_1, X_2 \dots \dots X_n$ be a random sample from N(μ , σ^2) population. Find sufficient estimators of μ and σ^2
17. Let $X_1, X_2 \dots \dots X_n$ be a random sample from the uniform distribution with p.d.f f(x, θ) = $\frac{1}{\theta}$ 0 < x < ∞ , θ > 0. Obtain the maximum likelihood estimator for θ
18. A random sample of 100 men is taken and their mean height is found to be 180 cm. the population variance is 49cm^2. Find the 95% confidence interval for μ, the mean height of the population

MAJOR & ELECTIVE COURSES

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. (a) Let $X_1, X_2 \ldots \ldots X_n$ be a random sample from a Bernoulli distribution $f(x;\theta) = \theta^x(1-\theta)^x$
$(x = 0,1)$, $0 < \theta < 1$

Show that $\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$ is a UMVUE of θ

(b) $X_1, X_2 \ldots \ldots X_n$ be a random sample from a Poisson distribution $P(\lambda) i.e$ f(x, λ) $= \frac{e^{-\lambda}\lambda^x}{x!}$ Find a sufficient estimator for the parameter λ

20. Obtain 100(1 - ∝)% confidence intervals for the parameter (i) μ and (ii) σ^2, of the normal distribution mean μ and variance σ^2

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V Semester B.Sc. (CUFYUGP) Degree Examinations

STA5CJ302 Sampling Methods
(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A [Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Explain the different methods of collecting data.
2. Distinguish between a stratum and a cluster.
3. Define sampling frame and sampling unit.
4. Give an unbiased estimator of population proportion in SRSWOR.
5. Compare the variance of SRSWR and SRSWOR.
6. What are the applications of systematic sampling?
7. Distinguish between a questionnaire and schedule.
8. A population consists of 10 units. How many samples of size 3 can be taken from this population using simple random sampling without replacement?
9. What are the advantages of two stage sampling?
10. A sample of 30 students is to be drawn from a population consists of 300 students belonging to two colleges of strength 200 and 100 respectively. What is the value of $n1$ and $n2$ if we use proportional allocation?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. What are the principal steps in a sample survey?
12. What are the advantages of sampling over census?

13. Obtain an unbiased estimator of population mean in cluster sampling. Also find its variance.
14. Show that sample proportion, p is an unbiased estimate of population proportion, P. Also obtain the confidence interval for the population proportion.
15. Define simple random sampling. Differentiate the simple random sampling with and without replacement.
16. What does circular systematic sampling mean? Give an example
17. Explain probability and non-probability sampling.
18. Find an unbiased estimator of population total and its variance.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 Marks)

19. Define two stage sampling. Find an unbiased estimator for population mean and its variance in this situation.
20. A population consists of $N = nk$ units. Explain how would you obtain a systematic sample of size n from this population. Obtain an unbiased estimate of population total. Also obtain the variance of your estimator.

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V Semester B.Sc. (CUFYUGP) Degree Examinations

STA5CJ303 Testing of Hypothesis

VI Semester B.Sc. (CUFYUGP) Degree Examinations

STA6CJ301 Linear Regression Analysis
(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A [Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What are the assumptions of linear regression model?
2. What are the properties of least squares estimate?
3. Distinguish between R^2 and adjusted R^2.
4. Define PRESS Statistic.
5. How co-efficient of determination explains the goodness of fit of a regression model?
6. Define multicollinearity.
7. Explain VIF.
8. Write down the ANOVA table for testing the significance of regression model in multiple linear regression model.
9. Explain the concept of Box-Cox transformation?
10. Describe the role of residuals in detecting normality.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. . Describe simple linear regression model. Estimate the parameters in simple linear regression model using least squares.
12. Suppose that X is an $n \times p$ matrix of rank p. H is the hat matrix. Then prove that H and
$(I_n - H)$ are symmetric and idempotent.
13. What are the common sources of multicollinearity in regression analysis?
14. Explain the concept of variance stabilizing transformations.
15. Explain the test procedure for testing the slope and intercept of simple linear regression model.
16. Obtain the maximum likelihood estimator of the parameters in simple linear regression model.
17. Explain the role of residual analysis in regression analysis.
18. Explain residual and its properties

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19. Describe multiple linear regression models. How the departures from underlying assumptions are identified using residual analysis?
20. Estimate the least squares estimate and maximum likelihood estimate of regression co-efficient and σ^2 in multiple regression models.

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VI Semester B.Sc. (CUFYUGP) Degree Examinations

STA6CJ302 Design of Experiments I
(credits: 4)

Maximum Time: 2 hours Maximum Marks: 70

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

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Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

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Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.

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VI Semester B.Sc. (CUFYUGP) Degree Examinations

STA6CJ303 Stochastic Processes
(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define Moment Generating function and Laplace Transform.
2. Explain a Stochastic Process with stationary independent increment
3. Define the Markov property in the context of stochastic processes
4. Explain how a Markov Chain can be visualized as a graph.
5. State Mean ergodic theorem.
6. Three boys X, Y, Z are throwing a ball of each other, X always throw the ball to Y and Y always throws the ball to Z, but Z is just as likely to throw the ball to Y as to X. Write the transition probability matrix.
7. What is meant by steady-state distribution of a Markov chain ?.
8. When a state is said to be null recurrent.
9. State Chapman-Kolmogorov equation in Continuous time MC?
10. Define n step transition probability in a Markov Chain.

MAJOR & ELECTIVE COURSES

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Show that the one-step transition probability matrix (TPM) and the initial probability distribution determine the distribution of states in a Markov chain.
12. State and prove Bayes' theorem.
13. Discuss the relationship between the Poisson process and the binomial distribution in stochastic process.
14. If the transition probability matrix of a Markov chain with states $(1, 2)$ is given by $P = \begin{bmatrix} 0 & 1 \\ 1/2 & 1/2 \end{bmatrix}$. Find the stationary distribution of the chain..
15. Let X be a random variable follows binomial distribution with parameters n and p. Find the pgf of X.
16. Classify Stochastic process according to state space and time space.
17. Explain Gambler's ruin problem and obtain the one step tpm.
18. In a locality, out of 500 people residing, 120 are above 30 years of age and 300 are female. Out of the 120 who are above 30 years' age, 20 are female. Suppose after a person is chosen, you are told that the person is female. What is the probability that she is above 30 years of age

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19. State and prove Chapman-Kolmogorov equation.
20. Show that Communication is a class property.

V Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA5EJ301 Statistical Quality Control

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define Quality of Product. State meaning of Quality
2. Define Variables and attributes. State the necessity of two control charts for variables.
3. Briefly explain the Statistical basis of 3σ limits.
4. State all possible CL, UCL and LCL of Mean Chart.
5. Distinguish between "Defective" and "Defect".
6. Define AQL and RQL.
7. Define ASN and ATI

8. State the Advantages of Double Sampling Plan over Single Sampling Plan

9. Define OC function and Power function

10. Explain Sequential Sampling Plan

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Explain various sources of Variation. How these variations are detected?

12. Derive the Control Limits of p chart stating the assumptions.

13. Random samples of 50 items were chosen from a production process and the following number of defectives were observed. 7, 4, 6, 2, 8, 3, 5. 4, 7, 3. Construct d chart and state conclusions.

14. Explain the construction R Chart.

15. Explain Double Sampling Plan.

16. Explain errors in Sampling Inspection Plan. Define Producers and Consumers Risk

17. Define Control Chart. State how Control Charts are used to assess Statistical Control

18. Define LTPD, AOQ and AOQL

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19. The following data gives mean and standard deviation of samples of size 7 taken from a production process

Sample	1	2	3	4	5	6	7	8	9	10
Mean	47.6	49.2	50.0	45.9	48.4	47.9	49.2	51.2	51	49.3
Standard Deviation	1.62	1.98	2.03	1.76	1.57	1.68	1.92	2.09	2.04	1.84

20. Construct OC Curve of Single Sampling Plan [N=100, n = 30, C= 2]

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V Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA5EJ302 Optimization Techniques (credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. State General Form of LPP

MAJOR & ELECTIVE COURSES

2. Define Slack and Surplus variables
3. Define feasible and Basic Feasible Solution
4. Define Primal and Dual LPP
5. State the role of Artificial Variables in Simplex method of solving LPP
6. Define Non Degenerate BFS of a Transportation Problem
7. Define balanced and unbalanced Assignment Problem
8. Distinguish between Pure and Mixed Strategy
9. Define Saddle Point
10. Define Value of the Game

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Solve graphically Max $Z = 5x + 8y$, subjected to $3x + 4y \leq 12$, $x + y \leq 6$ and $x, y \geq 0$
12. Briefly explain the Simplex Algorithm of solving LPP
13. Show that the Dual of Dual is Primal
14. Express Transportation Problem as a special case of LPP
15. Solve the Assignment Problem

Job Machine	M1	M2	M3	M4
J1	10	8	11	7
J2	6	9	10	5
J3	11	12	8	7
J4	9	8	7	5

16. Explain the Minmax and Maxmin criterions used in soling games.
17. Explain the Principle of Dominance. Explain the method of solving a 2X2 game
18. Explain the graphical method solving 2Xn games

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Solve the LPP Max $Z = 2x + 5y + 3z$ subjected to $x + y + z \leq 9$, $2x - y + z \geq 4$ and $x, y, z \geq 0$
20. Solve the TP

From to	O1	O2	O3	O4	supply
D1	9	14	11	8	100
D2	12	7	6	12	250
D3	8	10	8	9	150
Demand	120	140	150	170	

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V Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA5EJ303 Biostatistics

MAJOR & ELECTIVE COURSES

(credits: 4)
Maximum Time: 2 hours Maximum Marks: 70
Section A
[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

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Section B
[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11.
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Section C
[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.
20.

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V Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA5EJ304 Econometrics
(credits: 4)

Maximum Time: 2 hours Maximum Marks: 70

Section A [Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define econometrics.
2. What is the purpose of specifying a model in econometrics?
3. Discuss the significance of the disturbance term in econometrics.
4. Explain the need of having error term in a regression model.
5. How is heteroscedasticity detected?
6. What do you mean by lagged variable?
7.What is positive and negative autocorrelation?
8. What do you mean by Durbin-Watson statistics?
9. What are the significance of dummy variable model?
10. What is the cause for multicollinearity in a model**?**

Section B [Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Write the Stochastic assumptions of Ordinary least square method
12. Discuss the scope of Econometrics
13. OLS estimations are BLUE' Substantiate

14. Obtain an unbiased estimator of the variance of the error term in the simple linear regression model.
15. Examine the Almon approach to estimate distributed lag models.
16. What are the consequences of errors in explanatory variables in regression models? Indicate the use of instrumental variables in such cases
17. Define coefficient of determination and indicate its significance
18. Discuss the concept of multicollinearity in multiple regression analysis. What are the consequences of multicollinearity**?**

Section C [Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Describe two statistical tests commonly used to detect heteroscedasticity in regression models. Discuss the interpretation and limitations of these tests.
20. Discuss the potential effects of autocorrelation on the validity of regression results and suggest two approaches to handle autocorrelation in empirical analysis.

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V Semester B.Sc. (CUFYUGP) Degree Examinations

STA5EJ305: Official Statistics

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A [Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

11. Write a note on International Statistical System.
12. Give the administrative structure of State Statistical System.
13. What are the functions of CSO?
14. Mention any three publications of CSO.
15. What do you mean by projection of Labour force?
16. What is the Index of Industrial Production?
17. Explain the construction of Human Development Index.
18. How we compute Gini Coefficient.
19. What is Theil's measure of income inequality?
20. What do you mean by Social Statistics?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

19. Explain the activities of NSSO.
20. Explain the various methods of collection of official statistics.
21. Explain the functions of MoSPI.
22. Explain how we evaluate the performance of family welfare programmes.
23. What is cost of living index? Give its applications.
24. Briefly describe the economic development in India after independence.
25. What is National Income? Explain the income approach of estimation of National Income.
26. What is Lorenz curve? Explain how it is used to measure the income inequality.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

21. Explain the scope and contents of population census in India.
22. (a) Explain the measures of poverty and discuss the different issues related to its measurement.

    (b) Explain the expenditure approach in National Income estimation.

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V Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA5EJ306 Longitudinal Data Analysis
(credits: 4)
Maximum Time: 2 hours Maximum Marks: 70

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11.
12.
13.
14.
15.
16.
17.
18.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.
20.

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V Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA6EJ301 Simulation Techniques
(credits: 4)

MAJOR & ELECTIVE COURSES

Maximum Time: 2 hours Maximum Marks: 70

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11.
12.
13.
14.
15.
16.
17.
18.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.
20.

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VI Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA6EJ302 : Reliability Theory

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define (i) state vector (ii) coherent structures and (iii) pivotal decomposition of a coherent structure.
2. Define path set and minimal path set and give examples each.
3. Distinguish between relevant and irrelevant components. Give examples each.
4. Explain any one method of computing exact system reliability.
5. Derive the reliabilities of series and parallel structures.
6. Let $h(\underline{p})$ be a system reliability of a coherent system, then show that $h(\underline{p})$ is strictly increasing in each p_i for $0 < p_i < 1$ for all i.
7. Define lack of memory property. Show that exponential distribution possesses that property.

8. Distinguish between type I and type II censoring.
9. Explain IFR, IFRA and DMRL classes.
10. Briefly explain ageing property of exponential distribution.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Define Bridge structure. Represent a bridge structure as parallel-series/series-parallel structure.
12. Let $\phi(\underline{x})$ be the structure function of a coherent system of order n. Then show that $\prod_{i=1}^{n} x_i \le \phi(\underline{x}) \le \coprod_{i=1}^{n} x_i$.
13. Derive the reliability of a k-out-of-n structure.
14. Write a short note on reliability importance of components.
15. Show that the hazard function uniquely determines the reliability function.
16. Discuss the monotonicity of hazard function of Weibull distribution.
17. Show that constant hazard function is a characteristic property of exponential distribution .
18. Discuss the ageing property of lognormal distribution.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Let ϕ be a coherent structure. Then show that
    $(i)\phi(\underline{x} \vee \underline{y}) \ge \phi(\underline{x}) \vee \phi(\underline{y})$ (ii) $\phi(\underline{x}.\underline{y}) \le \phi(\underline{x}).\phi(\underline{y})$
20. Explain inclusion exclusion principle for finding system reliability.

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VI Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA6EJ303:Lifetime Data Analysis

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define the survival function and explain its importance in survival analysis.
2. What is the hazard function? Derive the hazard rate function for exponential distribution
3. How are point-wise confidence intervals constructed for the survival function?
4. Describe log location scale models and discuss their advantages in survival analysis.
5. Define a life table in the context of survival analysis. What information does it provide?
6. Obtain the survival function and hazard function of Weibull distribution and examine its monotone behaviours.
7. What are the methods for estimating the survivor function for Type II censored data?
8. Explain briefly, how regression models can be used for comparing or testing the equality

of two distributions.

9. What are additive hazards regression models?
10. Discuss estimators of cumulative hazard functions for right-censored data.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Explain accelerated failure time model.
12. Find the MLE of λ under the type I censoring, when the lifetimes T_i follows exponential with mean $\frac{1}{\lambda}$.
13. What are mixture models in the context of survival analysis? Provide a brief overview.
14. Discuss truncation in survival analysis and explain how it differs from censoring.
15. Define Kaplan Meier estimate. Show that it can be derived as a non-parametric MLE of the survival function.
16. Explain in detail the Quantile- Quantile Plot.
17. Describe semiparametric proportional hazards regression with fixed covariates.
18. Explain left censoring and discuss its implications for survival data analysis.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Explain type I censoring, Type II censoring and Progressive type II censoring. Derive the likelihood function in each case.
20. For the data on remission times (in days) given below obtain Kaplan-Meier estimator of survival function S(t) at t=1, 10, 29 and 60.
    1, 1, 2, 4, 4, 6, 6, 6, 7, 8, 9, 9, 10, 12, 13, 14, 18, 19, 24*, 26, 29, 31*, 42, 45*, 50*, 57, 60, 71*, 83*, 91. (Here * denote the censored observations).

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VI Semester B.Sc. (CUFYUGP) Degree Examinations October 2024
(credits: 4)

STA6EJ304 Demography

Maximum Time: 2 hours **Maximum Marks: 70**

Section A [Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What are the sources of demographic data, and how are they collected?
2. Define net migration
3. Explain the concepts of census and registration in demographic studies.
4. What is the total fertility rate, and how is it calculated?
5. Discuss ad-hoc surveys and hospital records as sources of demographic data.
6. Define the crude birth rate and discuss its calculation method.
7. Define the infant mortality rate.
8. What is the crude death rate, and how is it calculated?

9. Describe standardized death rates and their significance in demographic analysis.
10. Explain the general fertility rate

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Describe the demographic profiles generated by the Indian Census.
12. Explain age-specific death rates and their importance in mortality measurement.
13. What is a complete life table, and what are its main features?
14. Discuss stable and stationary populations.
15. How is the death rate by cause measured in demographic studies?
16. What is the total fertility rate, and how is it calculated?
17. Define the gross reproduction rate and net reproduction rate.
18. Explain abridged life tables and discuss stable and stationary populations.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Explain Life Tables. Discuss the uses of life tables
20. Describe the process of conducting decennial population census in India.

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STA6EJ305 Actuarial Statistics

MAJOR & ELECTIVE COURSES

VII Semester B.Sc. (CUFYUGP) Degree Examination March October 2027
STA 7 CJ 01: ADVANCED ANALYTICAL TOOLS

Time: 2 Hours Maximum Marks: 70 Marks

Section A

Answer All. Each question carries 3 marks (Ceiling: 24 Marks)

1. Define lower and upper Riemann Stieltjes sums.

2. Define poinwise convergence of a sequence of functions. Give an example.

3. Define generalized inverse of a matrix.

4. define orthogonal and orthonormal basis.

5. State the Cauchy condition condition for uniform convergence of a sequence of functions.

6. Define linear dependency and independency of Vectors over a field.

7. Define limit of a multivariable function.

8. Define directional derivative.

9. State first mean value theorem on integral calculus.

10. Define uniform convergence of sereis of functions. Discuss the uniform convergence of $\sum_{n=1}^{\infty} \frac{1}{n} \sin nx$

Section B

Answer All. Each question carries 6 marks (Ceiling: 36 Marks)

11. (i)Investigate the continuity of the function

$$f(x,y) = \begin{cases} \frac{xy}{\sqrt{x^2+y^2}}; & \text{if}(x,y) \neq (0,0) \\ 0 : & \text{if}(x,y) = (0,0) \end{cases}$$

(ii) Find the directional derivative of $f(x,y) = x^2y + 2yz - x$, at P(1,1) in a direction towards Q(2,-3,2).

12. Evaluate $\int_0^5 x \, d[x + [x]]$

13. Examine the pointwise convergence of a sequence of functions defined by $f_n(x) = \cos nx, -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

14. Define sub space. Show that, the intersection of any number of subspaces of a vector space V is also a subspace of V.

15. Obtain the orthogonal basis of the set of vectors {(1,1,1),(1,2,4),(-2,3,7)}

16. Explain Gram-Schmidt orthogonalization process.

17. If $f_n(x)$ converges pointwise to $f(x)$ on $S \subset R$ and $M_n = \sup_{x \in S} |f_n(x) - f(x)|$ then show that $f_n(x)$ converges uniformly to $f(x)$ on S if and only if $M_n \to 0$ as $n \to \infty$

18. State Taylors theorem on multivariable functions. Find third order Taylor series approximation of $f(x, y, z) = 2xy^2 + xz^3$ at (1,-1,1)

Section C

Answer any one. Each question carries 10 marks (1 x 10 = 10 Marks)

19. Define implicit functions. State and prove implicit function thorem for multivariable functions.

20. (i) Define a quadratic form. Find the matrix of the following quadratic form $ax^2+2hxy+by^2$
(ii)Show that every non- singular matrix A can be expressed as $A = QDR$, where Q and R are real orthogonal and D is real diagonal

VII Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA 7 CJ 402 : Probability Theory

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define random vector with an example.
2. Define minimal sigma field and generated sigma field.
3. State Kolmogorov three series theorem.
4. What do you mean by induced probability measure?
5. State Kolmogorov inequality.
6. Show that the characteristic function of a distribution is uniformly continuous and non-negative definite.
7. State the Radon-Nykodym theorem and give one application.
8. Define expectation of random variable.
9. Give an example to show that convergence in distribution doesn't imply convergence of moments.
10. State Lindeberg-Feller form of Central Limit Theorem.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Distinguish between Lebesgue measure and Lebesgue Stieltjes measure.
12. Show that $\varphi(t) = \frac{1}{8}\left(1 + 7e^{it}\right),\ t \in R$ is a characteristic function, but $|\varphi(t)|$ is not.
13. State and prove monotone convergence theorem.
14. State and prove the correspondence theorem.
15. Prove that a sequence of random variables converges almost surely to a random variable if and only if the sequence converges mutually almost surely.
16. Show that the convergence in probability does not implies convergence in r^{th} mean.
17. State and prove Borel 0-1 law.
18. Check whether WLLN and Central Limit theorem hold for the independent sequence, $\{X_n\}$, with $P\left[X_k = \pm\, k^{\lambda}\right] = 1/2$.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. State and prove Kolmogrov 0-1 law.
20. State and prove the Lindberg – Levy central limit theorem.

VII Semester B.Sc. (CUFYUGP) Degree Examination October 2027

STA 7 CJ 403 : DISTRIBUTION THEORY

(Credits : 4)

Maximum Time : 2 Hours | Maximum Marks : 70

Section A

(Answer All. Each question carries 3 marks) (Ceiling : 24 Marks)

1. Define multivariate normal distribution.
2. State and prove additive property of multivariate normal distribution.
3. What are generalized variance.
4. Define Wishart distribution. State any three properties of Wishart distribution.
5. Prove that Wishart distribution is a generalization of $\sigma^2\chi^2$ distribution.
6. If $X \sim N(\mu, \Sigma)$, find the distribution of $(X-\mu)'\Sigma^{-1}(X-\mu)$
7. Derive the context in which $X \sim N(0, I)$ obtains the condition under which $X'AX$ and $X'BX$ are independently distributed.
8. Differentiate between partial and multiple correlation
9. Is Hotelling T^2 is a generalization of the square of students-t statistic. Justify your answer.
10. Explain Mahalanobis D^2 statistic.

Section B

(Answer all. Each questions carries 6 marks) (Ceiling : 36 Marks)

11. "Normality of marginal distribution need not imply normality of joint distribution". Verify
12. If $X \sim N_p(\mu, \Sigma)$, find the distribution of $Y = CX$, where C is a non singular matrix of order p.
13. Let $X \sim N_p(\mu, \Sigma)$, obtain the MLE's of Σ.
14. Let $X_1, X_2, \ldots, X_n$ be a random sample from $N_p(\mu, \Sigma)$. Obtain the distribution of the sample generalized variance.
15. Let $X_1, X_2, \ldots, X_n$ i.i.d random variables such that $X_i \sim N_p(\mu, \Sigma),\ i = 1, 2, \ldots, n$. Prove that the mean vector X and sum of product matrix A are independent.
16. Establish the necessary and sufficient condition for the independence of two quadratic forms

17. Derive the sampling distribution of the multiple correlation coefficient of X_1 on $X_2, \ldots, X_p$ when these are jointly normally distributed as $N_p(\mu, \Sigma)$ with the corresponding population multiple correlation coefficient is zero.

18. Show that Hotelling's T^2 statistic is invariant under non-singular transformation.

Section C

(Answer any one. Each questions carries 10 marks) (1 x 10 =10 Marks)

19. Derive the test criterion to test the hypothesis that mean vectors of two multivariate normal populations are equal when they have same unknown covariance matrix.

20. State and prove Cochran's theorem on quadratic forms.

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VII Semester B.Sc. (CUFYUGP) Degree Examinations October 2024
STA 7 CJ 404 Advanced Sampling Methods and Design of Experiments
(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define ratio and regression estimators.
2. Distinguish between multistage and multiphase sampling.
3. Discuss the relative efficiency of ratio and regression estimators.
4. Explain the merits and demerits of Midzuno scheme of sampling.
5. Define Horvitz-Thompson estimator and derive an expression for its variance.
6. Define Balanced Incomplete Block Design. State any three relations between its parameters.
7. Explain briefly about Youden Square Design.
8. Distinguish between total and partial confounding.
9. Explain the concept of strip plot design.
10. Write a short note on fractional factorial designs.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Show that ratio method of estimation provides an efficient estimator of the population mean if the regression of y on x is linear and passes through the origin.
12. Write down the estimate of population mean in cluster sampling and derive its variance.
13. Explain probability proportional to size sampling. Indicate any one method of obtaining a P.P.S sample.
14. What do you understand by ordered estimates? Write down the ordered estimate proposed by Des Raj for the case of two draws. Examine whether it is unbiased.
15. Explain the intrablock analysis of Balanced Incomplete Block Design.
16. Explain Lattice design.
17. Define main effects and interaction effects. Illustrate Yate's method of computing various effects by taking a 2^4 factorial experiment.
18. Explain the analysis of 3^2 factorial design.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Explain cluster sampling. Write down the estimate of population mean in cluster sampling and derive its variance. Compare the precision of the estimate by cluster sampling with SRS.
20. Explain the analysis of split plot design.

VII Semester B.Sc. (CUFYUGP) Degree Examinations October 2024
STA 7 CJ 405 Advanced Statistical Inference
(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. State Basu's theorem and one of its applications.
2. Define complete sufficient statistic.
3. State Lehmann-Scheffe theorem.
4. Describe method of moment estimation for finding consistent estimator.
5. Write a short note on fiducial intervals.
6. Show that Cauchy distribution has no monotone likelihood ratio.
7. Define UMP α - similar test.
8. Define locally most powerful test.
9. Derive the relation between strength and boundary values of SPRT.
10. Compare sequential test with classical test.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Let $X_1, X_2, ..., X_n$ be a random sample from $N(\mu, \sigma^2)$. Obtain an ancilliary statistic for σ^2.
12. State Rao-Blackwell theorem. What are its applications?
13. State Cramer Rao inequality. Give an example where the Cramer Rao lower bound is attained and another one where it is not attained.
14. Obtain the shortest length confidence interval for σ^2 based on a random sample $X_1, X_2, ..., X_n$, from $N(\mu, \sigma^2)$ when μ is known.
15. Define LR test and show that it is consistent asymptotically.
16. If X follows $N(0, \sigma^2)$, show that there does not exist UMP test of $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 \neq \sigma_0^2$
17. Show that SPRT terminates with probability one.
18. If X follows Poisson with parameter λ, obtain SPRT for testing $H_0 : \lambda = \lambda_0$ against $H_1 : \lambda = \lambda_1$.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Define minimal sufficient statistic with suitable example. Prove or disprove "A minimal sufficient statistic may not be complete."
20. (a) State and prove Walds fundamental identity.
    (b) Develop SPRT and derive ASN function for testing $H_0 : \rho = \rho_0$ against $H_1 : \rho = \rho_1 (\rho_1 > \rho_0)$ if X has point binomial distribution.

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Eight Semester B.Sc. (CUFYUGP) Degree Examinations

STA 8 CJ 406 ADVANCED STOCHASTIC PROCESS AND TIME SERIES ANALYSIS

MODEL QUESTION PAPER

Time: 2 Hours Maximum Marks: 70

PART A

(Answer All. Each question carries **3** marks)

1. Explain pure birth process.
2. What are the basic characteristics of queues? Explain any one of them.
3. State and prove Wald's equation.
4. Define Branching Process with example.
5. Explain limiting form of random walk
6. Explain (i) White noise (ii) Gaussian process
7. Define a time series. How is it related with a stochastic process?
8. Obtain the autocorrelation function of moving average model of order 1
9. Define a moving average model of order p (MA(p))
10. Explain forecasting using ARIMA model

(Ceiling: 24 Marks)

PART B

(Answer All. Each question carries **6** marks)

11. Explain birth and death queueing models
12. Find Kolmogorov forward and backward equations for birth and death processes
13. Distinguish between weak and strict stationary stochastic processes. Give an example for each case
14. With probability one, show that $N(t) / t \to 1 / \mu$ as $n \to \infty$, where N(t) represents the total number of renewals by time t
15. Define GARCH(1,1) model and describe any two properties of GARCH(1,1) model
16. Explain the duality between AR and MA time series models
17. Explain forecasting using ARIMA models
18. Explain autoregressive integrated moving average model

(Ceiling: 36 Marks)

PART C

(Answer any one. Each question carries **10** marks)

19. Derive the steady state probabilities of a single server exponential queueing system.
20. Discuss the maximum likelihood estimation procedure for ARMA(1,1) model

(1x10 =10 Marks)

VIII Semester B.Sc. (CUFYUGP) Degree Examination March 2028
STA 8 CJ 407 : APPLIED MULTIVARIATE TECHNIQUES
(Credits : 4)

Maximum Time : 2 Hours   Maximum Marks : 70

Section A

(Answer All. Each question carries 3 marks)   (Ceiling : 24 Marks)

1. Explain the concept of principle components
2. Compare principal component analysis with factor analysis.
3. Explain orthogonal factor model.
4. What are canonical variates and canonical correlation.
5. Explain sphericity test
6. Explain Fisher linear discriminant function in the problem of classification.
7. Formulate the classification problem as a special case of a statistical decision problem.
8. Explain the relation between Mahalnobi's D^2 and Fisher's discriminant function.
9. What is profile analysis
10. Explain cluster analysis

Section B

(Answer all. Each questions carries 6 marks)   (Ceiling : 36 Marks)

11. Establish the relation between principal components and the eigen vectors of the variance-covariance matrix.
12. Define canonical correlation. Obtain it as the roots of certain detrimental equation associated with covariance matrix.
13. Explain the classification rule with two multivariate normal population with unequal variance-covariance matrix.
14. Explain Bayes classification rule.
15. Explain how would you test whether the constructed discriminant function best discriminates the individuals of the mixture.
16. Derive the linear discriminant function for classifying an observation between two multivariate normal distribution.
17. Explain the agglomerative method in cluster analysis

18. Distinguish between hierarchial and non-hierarchial clustering methods.

Section C

(Answer any one. Each questions carries 10 marks) (1 x 10 =10 Marks)

19. Explain how principal component can be used in the factor analysis. Point out factor rotation, its need and consequences.

20. Describe the two way fixed effect of MANOVA model, stating the assumptions clearly.

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VIII Semester B Sc. (CUFYUGP) Degree Examination March 2028

STA 8 CJ 408 : GENERALIZED LINEAR MODELS

Maximum Time : 2 Hours **Maximum Marks : 70 Marks**

Section A

[Answer All. Each question carries 3 marks] (Ceiling : 24 Marks)

1. Define a generalized linear model (GLM) and show that the Poisson regression model is a special case of GLM.
2. Discuss the importance of identifiability and estimability in the context of GLM.
3. Differentiate between quantitative and qualitative explanatory variables in GLM. Provide examples for each.
4. How do you interpret the effects of explanatory variables in a GLM?
5. Define exponential dispersion family distributions. Provide examples of distributions that belong to this family.
6. Describe binary logistic regression model with nominal responses.
7. Define deviance and give its significance in assessing model fit in GLM.
8. Describe probit models for binary data. Differentiate it from the logistic model.
9. Illustrate the connection between Poisson and Multinomial models for contingency tables.
10. Describe the quasi-likelihood approach in GLM models.

Section B

[Answer All. Each question carries 6 marks] (Ceiling : 36 Marks)

11. Explain the following terms related to GLM:
    a. Random component
    b. Linear predictor
    c. Link function
12. Explain the concept of identifiability in GLM. Provide examples to illustrate scenarios where identifiability issues may arise and how they can be addressed.
13. Define odds ratios. How are odds ratios interpreted in the context of binary logistic models?
14. Differentiate between log-log and complementary log-log models for nominal responses.
15. Explain the application of Poisson GLMs for counts and rates in models for count data.
16. What are zero-inflated datasets? Briefly explain the construction and inference of one of the GLM models in this context.
17. State the importance of Negative binomial GLM and explain the inference procedures and applications of it.
18. Explain the method of quasi-likelihood for adjusting the over dispersion in the Poisson model.

Section C

[Answer any one. Each question carries 10 marks] (1 x 10 = 24 Marks)

19. Explain the fitting and inference procedures of binary logistic regression models with ordinal responses.

20. Discuss multinomial response models in the context of GLM, highlighting their applications and limitations.

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VIII Semester B Sc. (CUFYUGP) Degree Examination March 2028

STA 8 EJ 412: OPERATIONS RESEARCH

Maximum Time: 2 Hours **Maximum Marks: 70 Marks**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What do you mean by canonical form of LPP?

2. What is the difference between feasible solution and basic feasible solution?

3. State any one advantage of simplex method of solving an LPP over graphical method.

4. What are the different types of Integer Programming Problems?

5. What is Lagrange Multipliers method of optimization?

6. What is Gomory's fraction cut?

7. Consider the nonlinear optimization problem

   Maximize f (x, y) = $x^2 + y^2$ subject to g (x, y) =x+2y-3 ≤ 0

   State the Kuhn -Tucker conditions for this problem.

8. What are the different steps used in Wolfe's Modified simplex method?

9.How will you formulate a general linear programming problem by dynamic programming

10. Write a note on shortest path model.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Solve the following LPP by using revised simplex method

    Max. z = $x_1 + 2x_2$

    Subject to

    $x_1 + 2x_2 \leq 3$

    $x_1 + 2x_2 \leq 1$, x_1 , $x_2 \geq 0$

12. Solve the following mixed integer programming problem using branch and bound method.

    Max.: Z = 5X + 6Y

    Subject to:

    X + Y ≤ 5

    4X + 7Y ≤ 28

13. Draw the network of the project consisting of 5 jobs A, B, C, D and E with the following job sequence:

Job A precedes C and D

Job B precedes D

Job C and D precede E

14 Explain Newspaper Boy problem.

15. The demand for an item is 18000 units per year. The holding cost is Rs1.20 per unit time and the cost of shortage is Rs.5.00. The production cost is Rs.400.00. Assuming that replacement rate is instantaneous determine the optimum order quantity.

16. Solve the following NLPP using Kuhn-Tucker conditions

Maximize Z=$16x_1 + 6x_2 - 2{x_1}^2 - {x_2}^2 - 17$

Subject to $2x_1 + x_2 \le 8$

$x_1, x_2 \ge 0$

17. Explain cutting plane method and Branch and Bound method. What are the differences between these two methods.

18. What are the major limitations of the PERT model? Discuss

Section C

[Answer any one. Each question carries 10 marks] (1 x 10 = 24 Marks)

19. A project schedule has the following characteristics.

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (Days)	4	1	1	1	6	5	4	8	1	2	5	7

1. Construct a network diagram.
2. Compute the earliest and latest event time
3. Determine the critical path and total project duration.
4. Compute the total and free float for each activity.

20. The following table gives the annual demand and unit price of four items.

Item	A	B	C	D
Annual demand (Units)	800	400	392	13800
Unit Price (Rs.)	0.02	1.00	8.00	0.20

Order cost is Rs.5 per order and holding cost is 10 percent of the price.

i) Determine the EOQ in units.
ii) Calculate total variable cost.
iii) Calculate the EOQ in year of supply
iv) Determine the number of orders per year?

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Eight Semester B Sc. (CUFYUGP) Degree Examination October 2024

STA 8 EJ 413 : Queueing Models

Maximum Time : 2 Hours **Maximum Marks : 70 Marks**

Section A

[Answer All. Each question carries 3 marks] (Ceiling : 24 Marks)

1. What do you mean by transient and steady state queueing systems?
2. Define Littles formula.
3. Define queueing system and queueing network. Give examples.
4. Define bulk input model ($M^{[X]}/M/1$).
5. Differentiate between open and closed Jackson network.
6. For a $M/M/1/\infty$ model with average arrival rate 10 per hour and average service rate 5 per hour, find (a) Expected number of customers in the queue (b) expected waiting time in the queue.
7. Write r program to find (a) expected waiting time in the queue (b) expected number of customers in the system (c) Expected number of customers in the queue for a $M/M/1/\infty$ model with average arrival rate 20 per hour and average service rate 30 per hour.
8. Explain series queues with blocking.
9. Customers arrive to a shop at an average arrival rate 5 per 8 hour and arrival rate follows Poisson distribution. Average service time is 40 minutes, service time follows exponential distribution. Find idle time per hour.
10. Define G/M/1 queueing model.

Section B

[Answer All. Each question carries 6 marks] (Ceiling : 36 Marks)

11. Define queueing system. explain basic characteristics of queueing system.
12. Derive steady state solution of $M/M/C/\infty/FCFS$ queueing model.
13. Define different Erlangian queueing models.
14. Explain bulk service model ($M/M^{[Y]}/1$) and derive differential-difference equations for the probabilities of having n customers in the system.
15. A bank has three cash paying assistants,average arrival rate of customers is 6 per hour and follows Poisson distribution. The service time is found to have an exponential distribution with a mean of 18 mins. The customers are processed on FCFS basis. Calculate
    a) Average number of customers in the system
    b) Average time a customer spends in the system
    c) Average queue length.
16. Write a short note on priority queues.
17. Explain open Jackson networks with multiple customer classes.
18. Consider a shop with a single server. Customer arrives to the shop according to Poisson input process with a mean rate of 30/hr. The service time follows exponential distribution with mean of 90 seconds. Find (a) Mean queue length. (b) Mean waiting time in the system.

Section C

[Answer any one. Each question carries 10 marks] (1 x 10 = 24 Marks)

19. (a)Explain Markovian birth-death process

    (b) Obtain P_0 and P_n of birth-death process.

20. State and derive Pollaczek- Khintchine formula.

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Eight Semester B Sc. (CUFYUGP) Degree Examination October 2024

STA 8 EJ 417 : Research Methodology

Maximum Time : 2 Hours **Maximum Marks : 70 Marks**

Section A

[Answer All. Each question carries 3 marks] (Ceiling : 24 Marks)

1. Define quantitative and qualitative research. Discuss the key differences in their approaches and methodologies

2. Discuss the contributions of India to the development of statistical methods and concepts

3. Discuss the advantages of using LaTeX for writing scientific articles and theses

4. Explain the significance of random variables in simulation. How do they contribute to capturing uncertainty in a model?

5. Explain the concept of matrix inversion

6. Discuss the advantages and limitations of using a descriptive research design

7. Discuss the role of graphics, charts, and multimedia in enhancing the quality of scientific slides.

8. Outline the steps involved in developing a research schedule for a study

9. Differentiate between applied and fundamental research. Provide examples to illustrate each type.

10. Explain how to critically evaluate and select relevant articles from a statistical database.

Section B

[Answer All. Each question carries 6 marks] (Ceiling : 36 Marks)

11. What are the essential features of PowerPoint that make it suitable for creating slides for scientific presentations?

12. Describe the concept of numerical integration error and strategies to minimize error in the approximation process

13. Compare and contrast the bisection method and the Newton-Raphson method for solving algebraic equations. When is one method preferred over the other?

14 Explain the Markov Chain Monte Carlo (MCMC) principle and its role in sampling from complex distributions

15 Explain how computer applications have revolutionized scientific research. Provide examples of software used in data analysis and visualization

16. Define numerical integration and explain its significance in approximating definite integrals

17. Describe the properties and applications of Uniform (U(0,1)) and Exponential distribution

18. Explain the key features of MS-Word that make it a popular choice for scientific document preparation.

Section C

[Answer any one. Each question carries 10 marks] (1 x 10 = 24 Marks)

19. Provide examples of scenarios where grouping, loops, and conditions are useful in R programming.

20. Discuss the role of research objectives in formulating research questions

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VIII Semester B Sc. (CUFYUGP) Degree Examination October

STA 8EJ 418: Advanced trends in Statistics

Maximum Time : 2 Hours **Maximum Marks : 70 Marks**

Section A

[Answer All. Each question carries 3 marks] (Ceiling : 24 Marks)

1. Define infinite divisibility property of a probability distribution. Give one example each from continuous and discrete cases.
2. Show that if ϕ is i.d. then |ϕ| is also i.d.
3. State the connection between i.d. distributions and continuous convolution semigroups.
4. Define a one sample U-statistic. State important properties of it.
5. State the asymptotic normality result of a one sample U-statistic with relevant assumptions.
6. Obtain the expression for variance of a U-statistic.
7. Define convolution order. Show that $X \leq_{conv} Y \Rightarrow X \leq_{st} Y$.
8. Describe dispersive order. Give an example.
9. Define star and superadditive orders.
10. Briefly explain monotone convex and monotone concave orders

Section B

[Answer All. Each question carries 6 marks] (Ceiling : 36 Marks)

11. Prove that the convolution of two i.d distribution functions is i.d.
12. State and prove Kolmogorov representation of an infinite divisible distribution.
13. Let $X_1, X_2, \dots X_n$ be a random sample from probability distribution $F(.)$ whose mean exists. Construct a U-statistic for the parametric functional $\theta(F) = (\int x \, d\, F(x))^2$ using the kernel function $h(x_{1,} x_2) = x_1 \, x_2$. Find the asymptotic distribution of the U-statistic.
14. Derive the variance of a U-statistic for a general kernel function.
15. Explain excess wealth order.
16. Let (X_i, Y_i), $i = 1, 2, \dots, m,$ be independent pairs of random variables such that $X_i \leq_{hr} Y_i$, $i = 1, 2, \dots, m$. Then show that

$$min\{X_1, X_2, \dots, X_m\} \leq_{hr} min\{Y_1, Y_2, \dots, Y_m\}.$$

17. Define hazard rate and mean residual life ordering of two random variables. Establish their inter relations.

18. Let X and Y be two non-negative random variables with distribution functions F and G and quantile functions F^{-1} and G^{-1} respectively. Then show that X is stochastically less than or equal to Y, if and only if $F^{-1}(p) \preccurlyeq G^{-1}(p)\ for\ all\ p\ \in\ (0, 1)$.

Section C

[Answer any one. Each question carries 10 marks] (1 x 10 = 24 Marks)

19. Explain in detail about non-parametric density estimation.

20. Define the following types of ordering and discuss their implications (with proof or counter example)

1. Hazard rate ordering.
2. Likelihood Ratio ordering.
3. Convex ordering.

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MINOR COURSES

MODEL QUESTION PAPERS

I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN101: Descriptive Statistics for Data Science

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What is meant by a variable? Define qualitative and quantitative variable.

2. Define independent events.

3. Find the value of the median from the following data: 10, 18, 9, 17, 15, 24, 30, 11.

4. The odds that person X speaks the truth are 3:2 and the odds that person Y speaks the truth are 5:3. In what percentage of cases are they likely to contradict each other on an identical point.

5. Define skewness and differentiate between positively and negatively skewed distributions.

6. Two unbiased dice are thrawn. Find the probability that the total of the numbers on the dice is 8.

7. In what way is graphical or diagrammatic representation of data superior to tabular presentation?

8. Calculate geometric mean from the following items: 133, 141, 125, 173, 182

9. Write any three drawbacks of harmonic mean.

10. Differentiate between histogram and bar diagram.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. The frequency distribution of wages in a certain factory is as follows:

Wages (Rs.)	250-259	260-269	270-279	280-289	290-299	300-309	310-319
No. of workers	10	18	15	20	13	8	2

Draw an ogive for this distribution.

12. Differentiate between qualitative and quantitative data.

13. From the following data find the value of x from the following data

Wages in rupees	110	112	113	117	x	125	128	130
No. of workers	25	17	13	15	14	8	6	2

14. Draw a histogram to the following data:

Years	MIll consumption of cotton (‘000 bales of 170kg each)
1976-77	6752
1977-78	6616
1978-79	6981
1799-80	7412
1980-81	7678
1981-82	7035

15. If A and B are independent events, then prove that (i) A^c and B are independent (ii) A^c and B^c are independent.

16. What are the methods of collecting primary data.

17. State and prove addition theorem on probability for two events.

18. Calculate mean deviation about mean of the following data:

Marks	5	15	20	25	35
No. of students	6	9	12	3	10

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19. (i) State and prove Baye’s theorem

(ii) On the basis of certain information it is known that the judgement given by a judge is correct in 90 percent of the cases. Suppose that 40 percent of the criminals produced before the court are actually innocent. Find the probability of the event that an innocent person produced before the court has been declared innocent.

20. The following data are given for two companies. Combining data for groups of male and female employees, find out (i) which company has a higher productivity per employee? (ii) which company has more consistent productivity?

Productivity per employee	Company A		Company B	
	Male	Female	Male	Female
Mean	32	22	19	32
Variance	9	4	12	4
No. of employees	40	12	24	32

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN101: Probability Theory I

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Define parameter and statistic.

2. A continuous random variable X has pdf f(x)=3x^2, $0 \leq x \leq 1$. Find a and b such that P(X≤ $a) = P(X > a)$.

3. A random variable X has the following probability function, fid the value of k:

x	0	1	2	3	4	5	6	7
P(x)	0	k	k^2	2k	$2k^2$	3k	2k	k^2

4. Define coefficient of determination.

5. State lack of memory property of exponential distribution.

6. Derive sampling distribution of sample mean of the samples from a normal population.

7. Distinguish between correlation and regression.

8. X is normally distributed random variable having mean 10 and S.D. 3. Find $P(X < 19)$

9. If X and Y are random variables, then show that E(X+Y)=E(X)+E(Y).

10. Define F distribution.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Derive the m.g.f. of normal distribution.

12. Prave that Poisson distribution is a limiting case of binomial distribution.

13. Find the mean of a random variable following chi square distribution with n degrees of freedom.

14. In a partially destroyed laboratory, record of an analysis of correlation data the following results are legible: variance of X is 9, regression equations are

8X-10Y+66=0 and 40X-18Y-214 =0. Find (i) mean of X and Y (ii) the correlation coefficient between X and Y.

15. Prove that the moment generating function of the sum of a number of independent random variables is equal to the product of their respective moment generating functions.

16. Define t distribution. Prove that the square of a t variate with n degrees of freedom is distributed as F with 1 and n degrees of freedom.

17. Derive mean of a binomial distribution. Given that the mean of a binomial distribution is 6 and variance is 4. Find the probability of success.

18. Fit a straight line of the form y=ax+b to the following data:

X	1	2	3	4	5	6	7
Y	21	14	19	25	12	17	13

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. (i) What are the assumptions of Karl Pearson's Correlation coeffieient.

(ii) Calculate the coefficient of correlation between X and Y from the following data:

X	60	61	62	63	64	65	68	70
Y	67	65	69	64	71	68	63	69

20. (i) Define normal distribution

(ii) In a normal distribution, 10.03% of the items are under 25 kilogram weight and 89.97% of the items are under 70 kilogram weight. What are mean and standard deviation of the distribution.

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III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN201: Statistical inference using R

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Write the R code to find the arithmetic mean of 18, 250, 3641, 47821, 500127

2. To test $H_0: \theta = 2$ against $H_1: \theta = 3$ based on a random sample of size one taken from the population with pdf $f(x, \theta) = \frac{1}{\theta}, 0 \le x \le \theta$. Find the size of the test if the critical region is x>1.5

3. Write the Output of the R Command

```
x<-seq(5,25,by=5);frequency<-c(5,2,10,3,8);
fr.dist<-data.frame(x,frequency);fr.dist;
```

4. Define consistency of estimators.

5. Prove or disprove that unbiased estimator is unique.

6. Define critical region.

7. Show that sample mean is an unbiased estimator of population mean.

8. Write the R command for entering the given data set using scan function and store it in the variable x and also write the command for mean and variance "1,2,3,1,4,5,6"

9. Differentiate between simple and composite hypothesis

10. Define efficiency of an estimator.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. (i) Define p value (ii) Write any two conditions of ch square test of goodness of fit.

12. Estimate a 95% confidence interval for μ based on 40 random samples with mean 25 and variance 4 taken from $N(\mu, 4)$.

13. In a sample of 1200people in a state A, 510 are wheat eaters and the rest are rice eaters. Can we assume that both rice and wheat are equally popular in this state at 5% level of significance.

14. Explain large sample test of testing the mean of a population when the population standard deviation is unknown.

15. Write the R command for getting a bar chart for the following data

Year	1995	1996	1997	1998	1999	2000
Annual Sales	10	18	22	19	15	12

16. Check the goodness of fit to the following data:

Class	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100
frequency	14	28	128	174	115	36	15	5

17. Random samples of 150 workers of a company 34 are dissatisfied with their working conditions. Froma a 95% confidence interval for the proportion of dissatisfied workers of the factory.

18. When σ^2 is known, prove that sample mean is a sufficient estimator of μ where the random sample is taken from $N(\mu, \sigma^2)$.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Define (i) type I and type II errors (ii) Find the probability of type I error of the test which rejects H_0 $if\ x > 1 - \alpha$ in favor $H_1\ if\ X$ has p.d.f. of the form $f(x) = \theta x^{\theta-1}, 0 < x < 1$, with $H_0 : \theta = 1$ and $H_1 : \theta = 2$. Find the power of a test.

20. Explain the method of maximum likelihood. Write any two properties of m.l.e. Find the m.l.e. of λ, based on random samples taken from Poisson population with parameter λ.

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN102: Applied statistics using R

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define Population & Sample
2. Define Simple Random Sampling
3. Distinguish between Census and Sampling
4. Write the expression for Marshall Edge Worth index number.
5. Write any two uses of index number
6. Define Quantity index number
7. Define Vital Statistic
8. Define General Fertility Rate
9. Write the R command for entering the given data set using scan function and store it in the variable x and also write the command for mean and variance "1,2,3,1,4,5,6"
10. Write the Output of the R Command

```
x<-seq(5,25,by=5);frequency<-c(5,2,10,3,8);
fr.dist<-data.frame(x,frequency);fr.dist;
```

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Explain Systematic Random Sampling

12. What are the principal steps in sample survey?

13. Distinguish between Time Reversal Test and Factor Reversal Test

14. Calculate the index number for 2019 taking 2009 as base by price relative method using Arithmetic mean.

Items	A	B	C	D
Price in Rs (2009)	10	20	30	40

Price in Rs (2019)	13	17	60	70

15. What are the methods of collecting Vital Statistics

16. What are the different Fertility rates?

17. Write the R command for getting a bar chart for the following data

Year	1995	1996	1997	1998	1999	2000
Annual Sales	15	25	27	28	26	26.6

18.Write the R Command for computing mean and median for the given data

Height	No of Students
50-53	2
53-56	7
56-59	24
59-62	27
62-65	13
65-68	3

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Find the Laspeyre's , Paasche's and Marshall Edgeworth Index number

Item	Price 1960	Price 1970	Quantity 1960	Quantity 1970
A	8	20	50	60
B	2	6	15	10
C	1	2	20	25

D	2	5	10	8
E	1	5	40	30

20.Calculate Crude Death Rate and Standardised Death Rate from the following Data.

Age(Years)	Population	No of Deaths	Standard population(%age distribution)
0-9	23000	443	19
10-19	19000	286	17
20-39	27000	293	28
40-59	22000	320	20
60-79	13000	272	11
Above 80	6000	396	5

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN102: Probability theory II

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1 Define marginal probability function for two variable

2. Find C,if $f(x,y) = c(x+2y)\ for\ x = 1,2\ ;\ y = 0,1\ is\ the\ joint\ p.m.f\ of\ (X,Y)$

3. If the joint p.d.f of X and Y $f(x,y) = 1\ for\ 0 < X < 1;\ 0 < Y < 1$, find $P(X > 0.2/Y > 0.6)$

4.If X and Y are two independent random variables with V(X)=25 and V(Y)=36 find V(2x+3Y)

5.State Addition Theorem of Expectation

6.Obtain the mean and variance of Geometric distribution

7.If X is a Rectangular distribution over (2,6), find the mean

8.Find the Cumulative distribution function of Smallest order statistic

9. Define Time Series.Give an example

10. What are the components of time series

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Let X and Y are two discrete random variables with joint probability distribution

$f(x,y) = \frac{x+2y}{27}$ x,y=0,1,2. Find the probability distribution of the random variable Z=X+Y

12.Given joint pdf of X and Y as

f(x,y)= $21x^2y^3$ 0<X<Y<1

=0 elsewhere

Find the marginal distribution of X and Y . Also verify whether X and Y are independent

13.The probability density function two random variables X and Y is given as

f(x,y)=2 $0 \le X \le Y \le 1$

=0 elsewhere

Show that the conditional mean and variance of X given Y=y are $\frac{y}{2}$ and $\frac{y^2}{12}$ *respectively*

14.Show that the sum of n independent exponential random variables follows gamma distribution

15.Define the beta variable of first kind .Obtain its mean and Variance

16.The Joint Probability distribution of two random variables X and Y is given by P(X=0, Y=1)=⅓, P(X=1,Y=-1)=⅓ and P(X=1, Y=1)=⅓ .Find the conditional probability distribution of X given Y=1.

17.Explain the method of Measuring Seasonal variation using simple average method

18. Obtain the trend values by finding four yearly moving averages for the following data

Year:	1985	1986	1987	1988	1989	1990	1991	1992
Value:	10	12	8	10	16	12	14	10

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.The probability density function two random variables X and Y is given as

f(x,y)=2 $0 \le X \le Y \le 1$

=0 elsewhere

Find the coefficient of correlation between X and Y

20.The following table shows the number of salesmen working in a certain concern

Year:	1990	1991	1992	1993	1994
Value:	28	38	46	40	56

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III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN202: Statistical inference for Data Science

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Define Convergence in Probability.

2.What are the assumptions of Central limit theorem ?

3. .State Chebyshev's inequality.

4.What is the test statistic used and it's distribution in large sample test of equality of means of two populations when population variances are known?

5.Define a one sample sign test and the null hypothesis concerned.

6.Write down the test procedure for testing the equality of variances.

7. Give a situation where ANOVA can be used.

8.Write down the mathematical model for two way anova.

9. What are the advantages of Non Parametric tests over parametric tests

10.Define run.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Examine whether WLLN hold for the sequence of independent random variables $P(X_i = \pm \sqrt{2i-1}) = 1/2$

12.State and prove Lindeberg – Levy central limit theorem for independent and identically distributed random variables

13. In a sample of 600 men from city A, 450 are found to be smokers. Out of 900 from city B, 450 are smokers. Do the data indicate that the cities are significantly different with respect to the habit of smoking?

14.The difference in scores obtained by two players in 11 game 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

15.. If X denote the sum of the numbers obtained when two dice are thrown, use Chebychev's inequality to obtain an upper bound for$P[|X-7| > 4$ .Compare this with the actual probability.

16.Explain the procedure of one way anova.

17.Explain the small sample test of equality of means of two populations

18.Explain Mann-Whiteny U test.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.A tea company appoints four salesmen A, B, C and D and observes their sales in three seasons-summer, winter and monsoon. The figures (in lakhs) are given in the following table : Perform a two way ANOVA

Season	Salesmen			
	A	B	C	D
Summer	36	36	21	35
Winter	28	29	31	32
Monsoon	26	28	29	29

20.A Company's trainees are randomly divided into three groups of 10 each and are given a course in management skills by three different methods.At the end of the training period, they are given a test and their scores are as follows

A	99	64	101	85	79	88	97	95	90	100
B	83	102	125	61	91	96	94	89	93	75
C	89	98	56	105	87	90	87	101	76	89

Use Kruskal -Wallis test to determine at 5%level of significance if the three methods are equally effective

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN103: Introductory statistics with R

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Define primary data

2. Differentiate between qualitative and quantitative data

3.What is grouped frequency distribution

4.Define Multiple bar diagram

5. Find arithmetic mean of data set 2,5,6,7,4,9

6.What are the limitations of median

7. Define geometric mean of two observations

8. What is meant by console in R programming

9. How we store a series of values in R programming as a vector

10. Give an example of Pictogram

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Describe the steps in constructing a Pie diagram

12. Calculate the mean for the following frequency distribution

Class interval	0-8	8-16	16-24	24-32	32-40	40-48
Frequency	8	7	16	24	15	7

13.Describe frequency polygon with an example.

14.The class marks in a frequency table(of whole numbers) are given to be 5,10,15,20,25,30,35,40, 45 and 50. Find out the following

1) the true classes 2)the true class limits 3)the true upper class limits

15.The following table shows the distribution of the number of students per teacher in 750 colleges

Students	1	4	7	10	13	16	19	22	25	28
Frequency	7	46	165	195	189	89	28	19	9	3

Draw the histogram for the data and superimpose on it the frequency polygon

16.A cyclist pedals from house to his college at a speed of 10 km/h and back from the college to his house at 15 km/h. Find the average speed.

17.Describe the merits and demerits of geometric mean

18. describe how to draw simple plots on R

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. An incomplete frequency distribution is given as below

Variable	Frequency	Variable	Frequency
10-20	12	50-60	?
20-30	30	60-70	25
30-40	?	70-80	18
40-50	65	Total	229

Given the median value is 46, determine the missing frequencies using median formula

20.The geometric mean of 10 observations on a certain variable was calculated as 16.2. It was later discovered that one of the observations was wrongly recorded as 12.9; in fact it it was 21.9. Apply appropriate correction and calculate the correct geometric mean.

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN103: Regression and probability theory

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Define range

2. List any three characteristics of an ideal measure of dispersion

3. Define independence of events

4.Differentiate between absolute and relative measures of dispersion

5. The mean of 5 observations is 4.4 and variance is 8.24. If three of the five observations are 1,2 and 6, find the other two?

6. Define scatter diagram

7. What are the limits of Karl Pearson coefficient of correlation

8.What is meant by bivariate data

9.Define regression analysis

10. Write down the samplespace of coin tossing experiment until head appears.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. For a group of 200 candidates, the mean and standard deviation of scores were found to be 40 and 15 respectively. Later on it was discovered that the scores 43 and 35 were misread as 34 and 53 respectively. Find the correct mean and standard deviation corresponding to the correct figures

12. An analysis of daily wages paid to the workers of two firms A and B belonging to the same industry gives the following results:

	Firm A	Firm B
Number of workers	500	600
Average daily wage	186	175

Variance of distribution of wages	81	100

1) Which firm A or B has a larger wage bill?
2) In which firm A or B, is there greater variability in individual wages?

13. State Bayes theorem.

14. Write down the conditions of mutual independence of three events

15. Describe axiomatic approach to Probability

16. Write the addition theorem in the case of independent events

17. Define conditional probability. Susan took two tests. The probability of of her passing both tests is 0.6. The probability of her passing the first test is 0.8. What is the probability of her passing the second test given that she has passed the first test?

18. The probabilities of A and B solving a problem are 0.5 and 0.6 respectively. What is the probability that the problem is solved if they solve it independently? What is the probability that the problem is not solved?

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Check whether the following can be regression equations. If so find

1) the regression coefficient 2) the correlation coefficient 3) the mean

20. Calculate the quartile deviation for the following data

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	6	5	8	15	7	6	3

****

III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN203 : Random variables and CART

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Define random variable
2.List any two properties of probability mass function

3.What are jump points in distribution function

4.Differentiate between discrete and continuous variable?

5. Define a binomial random variable

6. What are the properties of standard normal distribution

7. For a binomial distribution, mean=4 and variance =3. Find the last term

8. What are decision trees

9. What are the advantages of trees over linear models

10. What is meant by bagging?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11 . Given the pdf of a random variable X as $f(x) = 5e^{-5x}; 0 < x < \infty$ Show that P(X>7|X>5)=P(X>2)

12.Suppose that the chance of an individual coal miner being killed in a mine accident durin g a year 1/1400. Use Poisson distribution to calculate the probability that in a mine employing 350 miners, there will be atleast one fatal accident in one year.

13. Explain Random forest.

14. In a group of 100 people with mean IQ=105 and SD=5. Find the IQ below which there are 70% of the people, the IQ above which there are 35%and the limits within which the middle 50% of the IQ lie.

15. What are the advantages and disadvantages of trees

16. Define distribution function. What are its properties?

17. Four unbiased coins are tossed. Let X denote the number of heads minus the number of tails. Find the probability distribution of X and $P(-2<X<3.5)$?

18. Given a discrete random variable X with p.m.f.

x	0	1	2	3	4
f(x)	0.2	k	2k	k/2	0.1

Find the value of k? Also find $P(0.5<X<2.5)$

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. For a random variable X with possible values -3,-2,-1,0,1,2 and 3 given $P(X=-3)=P(X=-2)=P(X=-1)$; $P(X=3)=P(X=2)=P(X=1)$ and $P(X=0)=P(X>0)=P(X<0)$. Obtain the probability distribution of X and its distribution function.

20.Out of 800 families with 4 children each, how many would you expect to have 1) 2 boys 2) either 3 or 4 boys. Assume boys and girls are equally probable in that society.

****

I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN104 : Applied statistics

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Differentiate between primary data and secondary data

2.What is a questionnaire

3. What are the guidelines of drafting questionnaire

4. Define time series

5.Define Population & Sample

6. Define Simple Random Sampling

7. Distinguish between Census and Sampling

8. Write the expression for Marshall Edge Worth index number.

9. Write any two uses of index number

10. Define Vital Statistic

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. What are the components of time series

12. Explain Systematic Random Sampling

13. What are the principal steps in sample survey?

14. Distinguish between Time Reversal Test and Factor

Reversal Test

15. Calculate the index number for 2019 taking 2009 as base by price relative method using Arithmetic mean.

Items	A	B	C	D
Price in Rs (2009)	10	20	30	40

Price in Rs (2019)	13	17	60	70

16. What are the methods of collecting Vital Statistics

17. What are the different Fertility rates

18. Explain semi average method

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Find the Laspeyre's ,Paasche's and Marshall Edgeworth Index number

Item	Price 1960	Price 1970	Quantity 1960	Quantity 1970
A	8	20	50	60
B	2	6	15	10
C	1	2	20	25
D	2	5	10	8
E	1	5	40	30

20. Calculate Crude Death Rate and Standardised Death Rate from the following Data.

Age(Years)	Population	No of Deaths	Standard population(%age distribution)
0-9	23000	443	19
10-19	19000	286	17
20-39	27000	293	28

40-59	22000	320	20
60-79	13000	272	11
Above 80	6000	396	5

****

II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN104 : Regression using JASP software

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define skewness
2. List any two advantages of multiple correlation analysis
3. What are the assumptions of linear multiple regression analysis
4. What are the steps to find mean of a list of observations in JASP
5. What is meant by sampling distributions
6. Define statistic
7. Write down the test statistic of chi-square distribution
8. What is R^2 in multiple correlation
9. List two limitations of Partial Correlation
10. What is coefficient of multiple determination

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Calculate Pearson's measure of skewness for the following data

x	16	22	23	24	30	31	44
f	4	8	9	15	10	5	4

12. Explain Kurtosis.

13. In a trivariate distribution,if r_{12}=0.7 , $r_{13} = 0.61$ *and* $r_{23} = 0.4$. Find all the multiple correlation coefficients.

14.Write down the steps to calculate variance of set of observations using JASP

15. Describe the assumptions of a linear multiple regression analysis

16. Explain properties of multiple correlation coefficient

17. What are the statistics of Student's t and F distributions? Explain the notations.

18. Explain the significance of partial correlation coefficient.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.Set up a multiple regression on X_2 on X_1 and X_3 for the following data

X_1	54	55	57	59	60	62
X_2	10	12	16	13	12	14
X_3	35	38	31	34	34	40

20. From the data relating to the yield of dry bark (X_1), height (X_2) and girth ((X_3) for 18 cinchona plants, the following correlation coefficients were obtained:

$r_{12} = 0.77, r_{13} = 0.72 , r_{23} = 0.52$ Find the partial correlation coefficient $r_{12.3}$ and multiple correlation coefficient $R_{1.23}$

****

III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN204 : Tests of hypothesis and SVM

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define null hypothesis and alternative hypothesis
2. What is meant by simple hypothesis? Give an example
3. Define critical region
4. What are the two errors in testing
5. What is the test statistic for testing for single mean in small sample case
6. What is the major difference between t test and ANOVA
7. Define hyperplane
8. What is a classifier
9. Why we use a separating hyperplane
10. If the level of significance is 0.05, What do you mean by it?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Explain support vector machine
12. Explain the steps of testing of hypothesis
13. A study on immunization of cattle from tuberculosis brought the following data

	Affected	Unaffected	Total
Immunized	14	30	44
Not immunized	16	8	24
	30	38	68

Test whether the immunization hasan effect on the incident of tuberculosis

14. What is maximal margin classifier
15. Describe the conditions for validity of Chi-square goodness of fit test
16. A die is tossed 240 times shows the following result:

Number shown x	1	2	3	4	5	6
Frequency	32	38	46	44	34	46

Verify whether the die is unbiased . Use a 0.05 level of significance

17. What are the assumptions of ANOVA
18. How we construct maximal margin classifier

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Explain one way ANOVA

20. Explain the t test of difference of means

****

I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN105 : Descriptive statistics

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Differentiate between primary data and secondary data

2.What is population and sample

3.What is meant by chronological classification

4. Write the empirical relation connecting mean,median and mode

5. What is class width?

6. Define range

7. List any three characteristics of an ideal measure

of dispersion

8. The mean of 5 observations is 4.4 and variance is 8.24. If three of the five observations are 1,2 and 6, find the other two?

9. What is grouped frequency distribution

10. Give an example of Pictogram

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. An incomplete frequency distribution is given as below

Variable	Frequency	Variable	Frequency
10-20	12	50-60	?
20-30	30	60-70	25
30-40	?	70-80	18

40-50	65	Total	229

Given the median value is 46, determine the missing frequencies using median formula

12. For a group of 200 candidates, the mean and standard deviation of scores were found to be 40 and 15 respectively. Later on it was discovered that the scores 43 and 35 were misread as 34 and 53 respectively. Find the correct mean and standard deviation corresponding to the correct figures

13. Describe the steps in constructing a Pie diagram

14. Calculate the mean for the following frequency distribution

Class interval	0-8	8-16	16-24	24-32	32-40	40-48
Frequency	8	7	16	24	15	7

15. Describe the merits and demerits of geometric mean

16. The geometric mean of 10 observations on a certain variable was calculated as 16.2. It was later discovered that one of the observations was wrongly recorded as 12.9; in fact it it was 21.9. Apply appropriate correction and calculate the correct geometric mean.

17. Find the average speed of an object moving along 4 sides of a square at speeds 200,300,400 and 500 km/hr.

18. Describe how to find mode for grouped data

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. An analysis of daily wages paid to the workers of two firms A and B belonging to the same industry gives the following results:

	Firm A	Firm B
Number of workers	500	600
Average daily wage	186	175

Variance of distribution of wages	81	100

1. Which firm A or B has a larger wage bill?
2. In which firm A or B, is there greater variability in individual wages

20. Calculate the quartile deviation for the following data

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	6	5	8	15	7	6	3

****

II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN105 : Introduction to probability

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What is meant by bivariate data

2. What is scatter diagram

3. List any two limits of Pearson's correlation coefficient

4. What is meant by regression analysis

5. Write the sample space of the experiment of coin tossing experiment until head appears

6. Define events

7. What are the differences between correlation and regression

8. Define probability mass function

9. List the properties of distribution function

10. How we find rank correlation for untied data

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11.Define distribution function. What are its properties?

12. Four unbiased coins are tossed. Let X denote the number of heads minus the number of tails. Find the probability distribution of X and $P(-2<X<3.5)$?

13. Given a discrete random variable X with p.m.f.

x	0	1	2	3	4
f(x)	0.2	k	2k	k/2	0.1

Find the value of k? Also find $P(0.5<X<2.5)$

14. For the following data, compute the two regression equations and also find the value of correlation coefficient

X	2	3	6	4	5	4
Y	1	3	4	2	5	3

15. Explain axiomatic approach to probability

16. The probabilities of A and B solving a problem are 0.5 and 0.6 respectively. What is the probability that the problem is solved if they solve it independently? What is the probability that the problem is not solved?

17. Explain the properties of regression coefficients

18. State the addition theorem for two events. In an examination, 30% of the students have failed in Mathematics, 20% failed in Chemistry and 10% in both Mathematics and Chemistry. A Student is selected at random. What is the probability that the student has failed either in Maths or Chemistry.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. For a random variable X with possible values -3,-2,-1,0,1,2 and 3 given $P(X=-3)=P(X=-2)=P(X=-1)$; $P(X=3)=P(X=2)=P(X=1)$ and $P(X=0)=P(X>0)=P(X<0)$. Obtain the probability distribution of X and its distribution function.

20. Check whether the following can be regression equations. If so find

1) regression coefficient
2) correlation coefficient
3) mean

$1.2X+0.9Y=16$

$0.8X+1.08Y=10$

****

III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN205 : Inferential statistics

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define null hypothesis and alternative hypothesis
2. What is meant by simple hypothesis? Give an example
3. Define critical region
4. What are the two errors in testing
5. What is the test statistic for testing for single mean in small sample case
6. What is the major difference between t test and ANOVA
7. If the level of significance is 0.05, What do you mean by it?
8. Give statistic of F distribution
9. Define a standard normal variable
10. Define level of significance

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. A study on immunization of cattle from tuberculosis brought the following data

	Affected	Unaffected	Total
Immunized	14	30	44
Not immunized	16	8	24
	30	38	68

Test whether the immunization has an effect on the incident of tuberculosis

12. Explain the steps of testing of hypothesis

13. Describe the conditions for validity of Chi-square goodness of fit test

14. A die is tossed 240 times shows the following result:

Number shown x	1	2	3	4	5	6
Frequency	32	38	46	44	34	46

Verify whether the die is unbiased . Use a 0.05 level of significance

15. What are the assumptions of ANOVA

16. List the properties of Normal distribution

17. In a group of 100 people with mean IQ=105 and SD=5. Find the IQ below which there are 70% of the people, the IQ above which there are 35%and the limits within which the middle 50% of the IQ lie

18. List the Critical region of large sample test for one and two tailed tests

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Explain one way ANOVA

20. Explain the t test of difference of means

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN106 : Introductory statistics with JASP

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Define primary data

2.How will you scale a psychological measurement

3. What is scope of a survey

4.Define variable

5. Define line graph

6. Distinguish between range chart and band graph

7.Define histogram

8.How will you load data in JASP

9.How will you check whether the collected data is reliable or not?

10. What is meant by questionnaire

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11 What are the principal steps in planning a survey?

12.Describe the guidelines in drafting a questionnaire

13.What are the different methods in collecting primary data

14.What are different types of reliability

15.Distinguish between frequency polygon and frequency curve with example

16.What are the steps in finding median in JASP

17.What are different types of validity

18. Explain different scales of measurement

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Plot two ogives for the following data

Class intervals	frequency
410-419	14
420-429	20
430-439	42
440-449	54
450-459	45
460-469	18
470-479	7

20. Draw a frequency polygon and histogram for the following data

Class interval	Frequency
0-10	25
10-20	22
20-30	21
30-40	6

****

II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN106 : Correlation and regression

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define skewness
2. List any two advantages of multiple correlation analysis
3. What are the assumptions of linear multiple regression analysis
4. How will you plot simple plots in R. Write an example
5. What is Kurtosis
6. What are multiple graphs in R
7. What is meant by function in R
8. What is R^2 in multiple correlation
9. List two limitations of Partial Correlation
10. What is coefficient of multiple determination

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Calculate Pearson's measure of skewness for the following data

x	16	22	23	24	30	31	44
f	4	8	9	15	10	5	4

12. Explain Kurtosis.

13. In a trivariate distribution,if r12=0.7 ,r13=0.61 and r23 =0.4. Find all the multiple correlation coefficients.

14. How will you install R?

15. Describe the assumptions of a linear multiple regression analysis

16. Explain properties of multiple correlation coefficient

17. Calculate kurtosis for the data: 3,9,10,11,12,13

18. Explain the significance of partial correlation coefficient.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.Set up a multiple regression on X_2 on X_1 and X_3 for the following data

X1	54	55	57	59	60	62
X2	10	12	16	13	12	14
X3	35	38	31	34	34	40

20. From the data relating to the yield of dry bark (X_1), height (X_2) and girth ((X_3) for 18 cinchona plants, the following correlation coefficients were obtained:

r_{12}=0.77, r_{13}=0.72 , r_{23}=0.52 Find the partial correlation coefficient $r_{12.3}$ and multiple correlation coefficient $R_{1.23}$

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III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN206 : Tests of hypothesis with JASP software

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Define sample and population

2.Distinguish between census and sample survey

3.What is direct effect in mediation

4. What are differences between parametric and nonparametric methods

5.What is the null hypothesis of Sign test

6.What is the test statistic of Sign test

7. How will you calculate Pearsons correlation for a bivariate data in JASP

8. Explain briefly the plotting scatter plots in JASP

9.What is meant by confounding variable

10.Dfine random sampling

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Distinguish between SRSWR and SRSWOR

12. Explain Wald-Wolfowitz run test

13.To investigate whether any difference exists between the mean study time of male and female students ,study hours of 24 students were recorded which is given below

Male	2	3	1	2	2	3	2.5	3	1.5	1	.5	2
Female	3	2.5	1	4	5	3	1.5	3	4	3	4	2.5

On the basis of these data, canit be concluded that the mean study time of male and female differs? Test your hypothesis at 5% level.

14. Explain median test

15.Explain the steps for doing paired t test in JASP

16.Write briefly the estimation of direct,indirect and total effects in mediation analysis

17.Explain Purposive sampling

18. Explain random number table method

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19.Explain stratified sampling

20.A salesman of a company visited at random 8 cities. He got the following number of orders:5,6,4,8,2,4,9,1. Check whether the average number of orders obtained is less than 7. Use Sign test at 5% level of significance.

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN107 : Actuarial Mathematics I

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What is a cashflow model?
2. What do you mean by a fixed interest security?
3. Define present value.
4. What principal will amount to Rs.750 in 2 ½ years at 6% simple interest.
5. Define Principle of consistency.
6. Given δ=8%, calculate i
7. If i=7%, calculate $d^{(4)}$
8. What is an immediate annuity?
9. Calculate $\ddot{a}_{\overline{8}|}$ at i=5%.
10. Calculate the present value of a perpetuity paying £50 pa in arrears at an annual effective rate of interest of 6%.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Derive the expression for present value of an annuity where payments are made in advance.
12. Briefly explain deferred annuities.
13. Describe the features of a zero-coupon bond.
14. A bank offers two types of Fixed Deposit Accounts :
    Account A: The amount invested will earn 12% p.a. simple interest.
    Account B: The amount invested will earn 12% effective p.a. compound interest
    The interest along with the amount invested will be paid to the investor at the end of the chosen term of the fixed deposit. Which Account will give a higher maturity amount if the term of the deposit is :
    (i) 6 months (ii) 12 months (iii) 18 months
15. Given i = 0.08, Calculate
    a. $d^{(12)}$ b. $i^{(365)}$ c. δ d. $i^{(1/2)}$
16. A bank account pays an effective annual interest rate of 10% over 5 years. Calculate the equivalent:
    (i) Simple annual interest rate
    (ii) Effective monthly interest rate
    (iii) Effective two-yearly interest rate
    (iv) Effective annual discount rate
17. Distinguish between nominal rate of interest and nominal rate of discount.
18. Calculate the effective annual rate of interest for:
    (i) a transaction in which £200 is invested for 18 months to give £350.

(ii) a transaction in which £100 is invested for 24 months and another £100 is invested for 12 months (starting 12 months after the first investment) to give a total of £350.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19. X denotes the present value of an annuity consisting of payments of £2,000 payable at the end of each of the next 8 years, valued using an interest rate of 8% pa convertible quarterly. Y denotes the present value of an annuity consisting of payments of £4,000 payable at the end of every fourth year for the next 16 years, valued using an interest rate of 8% pa convertible half-yearly. Calculate the ratio X /Y.
20. Rs.50000 is invested at time 0 and the proceeds at time 10 are 92000. Calculate $A(7,10)$ if $A(0,9)=2.5$, $A(2,4)=1.8$, $A(2,7)=1.92$ and $A(4,9)= 2.01$.

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN107 : Actuarial Mathematics II

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define force of mortality.
2. What does ${}_tp_{xy}$ mean?
3. A level annuity of £1,000 pa is to be paid continuously to a 40-year-old male for the rest of his life. On the basis of 4% pa interest and AM92 Ultimate mortality, calculate the expected present value of this annuity.
4. What do you mean by deferred annuity?
5. Describe in words the difference in meaning between $A_{\overline{10}|}$ and A_{10}
6. Write down an expression for ${}_tq_x$ in terms of the function l_x
7. Claire, aged exactly 30, buys a whole life assurance with a sum assured of £50,000 payable at the end of the year of her death. Calculate the standard deviation of the present value of this benefit using AM92 Ultimate mortality and 6% pa interest.
8. Define curtate future life time.
9. Define the random variable T_{xy}
10. Define term assurance contract.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Define life table. Explain its construction.
12. Calculate:

    a) ${}_{12}P_{[50]+1}$ b) ${}_{10/}q_{[53]}$ c) ${}_{12}P_{73}$ d) ${}_{10}q_{56}$
13. Calculate:
    (i) $p_{\overline{62:65}}$
    (ii) ${}_3q_{\overline{50:50}}$
    assuming that the two lives are both independently subject to AM92 Ultimate mortality.
14. Define Last survivor random variable and derive an expression for its Cumulative distribution function.
15. Explain deferred assurance contract.
16. Explain temporary annuities payable annually in advance.
17. Using an interest rate of 6% pa effective and AM92 Ultimate mortality, calculate:
    (i) $A^{1}_{50:\overline{15}|}$
    (ii) $\bar{A}_{50:\overline{15}|}$
18. Briefly explain whole life assurance contract.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19. Calculate ${}_{1.75}p_{40.75}$ using Uniform Distribution of Deaths and Constant Force of Mortality assumptions (Basis: AM92 ultimate mortality).
20. Explain Endowment assurance contract. Also derive an expression for its expected present value and variance.

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III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN207 : Risk Modelling and Survival Analysis

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define survival function.
2. Define force of mortality
3. Suppose $X \sim \exp(\mu)$ and $N \sim Geo(p)$. Find $M_S(t)$.
4. Define compound Poisson distribution.
5. Define reinsurance policy.
6. Define future life time.
7. What is Machine learning?
8. Define central rate of mortality.
9. Explain what $S_{29}(36)$ represents.
10. Define insurable interest.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Distinguish between complete expectation of life and curtate expectation of life.
12. Explain Proportional Reinsurance arrangement.
13. A compound distribution S is such that P(N=0)=0.6, P(N=1) =0.3 and P(N=2)=0.1. Claim amounts are either 1 unit or 2 units, each with probability 0.5. Derive the distribution function of S.
14. Briefly explain various branches of machine learning.
15. Explain compound binomial distribution.
16. What are the general features of a product?
17. Explain probability of ruin in continuous time.
18. Determine an expression for the MGF of the aggregate claim amount random variable if the number of claims has a Bin(100, 0.01) distribution and individual claim sizes have a Gamma(10, 0.2) distribution.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19. Suppose that N ~ Poisson(λ) , M ~ Poisson(μ) , and N and M are independent. Use a convolution approach to derive the probability function of N+M.
20. Explain Gompertz land Makehams aw of mortality. Derive an expression for ${}_tp_x$ using Gompertz law.

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN108 : Financial Mathematics

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

21. What do you mean by data analysis?
22. Distinguish between stochastic and deterministic models.
23. Define retrospective method.
24. Define flat rate of interest.
25. Define deflation.
26. Write down any two drawbacks of modelling.
27. Define pure endowment contract.
28. A loan of £900 is repayable by level monthly payments for 3 years, with interest payable at 18.5% pa effective. Calculate the amount of each monthly payment.
29. A bank offers an effective annual rate of interest on one of its accounts of 4.2%. The rate of inflation is 3% pa effective. Calculate the real rate of interest.
30. Define descriptive analysis?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

31. Explain the usefulness of real and money interest rates
32. Briefly explain the data analysis process.
33. The force of interest is:

$$\delta(t) = 0.01t + 0.04, 0 \leq t \leq 5.$$

Find the present value at time 0 of the payment stream $0.5t + 2$, which is received between 0&5.

34. Calculate the present value at time 0 of payments of Rs.50 at time 0, Rs.60 at time 1, Rs. 70 at time 2 and so on. The last payment is at time 10. Assuming that the annual effective rate of interest is 4.2%.
35. A motorist borrows £5,000 to buy a car. The loan is repaid by level payments of £458.33 at the end of each of the next 12 months. Calculate the APR paid by the motorist.
36. Explain a contingent annuity.
37. What are the things to be considered while assessing the suitability of a model
38. Assuming a force of interest of 9% pa, calculate the accumulated value of £6.34 after:
    (i) 3 months
    (ii) 3 years
    (iii) 7 years and 5 days.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

39. The force of interest is given by

$$\delta(t) = \begin{cases} 0.04 + 0.002t, & 0 \le t < 10 \\ 0.015t - 0.08, & 10 \le t < 12 \\ 0.07 \quad , & t \ge 12 \end{cases}$$

a) Find the expression for the accumulation factor from time 0 to t.
b) Calculate the accumulation of Rs.150 from time t=0 to t=12

40. A loan of Rs.4000 is repayable over 5 years by level quarterly installments calculated using a rate of interest of 5% per annum effective.

a) Calculate the amount of each quarterly installment.
b) What is the capital content of the sixth repayment?
c) How much interest is paid in the second year?

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN108 : Actuarial Economics

(credits: 4)

Maximum Time: 2 ho **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

21. Differentiate microeconomics and macroeconomics.
22. State the law of demand
23. What is meant by new classical approach?
24. Define equilibrium price.
25. Define elasticity of supply.
26. Write a short note on the classification of economic systems.
27. When Peter's income increases by 10%, his demand for Good A increases by 2%, his demand for Good B increases by 15% and his demand for Good C decreases by 5%. Calculate and comment on Peter's income elasticity of demand for the three goods.
28. What is the limitations of the marginal utility approach to demand
29. What do you mean by demand curve?
30. Define marginal utility.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

31. Describe and discuss the scope of economics in terms of the problems of the allocation of scarce resources.
32. Write a note on Marxist socialism
33. What are the limitations of the marginal utility approach to demand ?
34. The market demand and supply functions for Good X are as follows:
    Qd = 1400 -P
    Qs = 200 +P
    (i) Calculate the current equilibrium market price and quantity of Good X.
    Suppose that the government introduces a subsidy of 100 on Good X.
    (ii) Calculate the revised equilibrium market price and quantity.
35. What are the factors affecting price elasticity?
36. The monthly premium for pet insurance increases from $10 to $12 and the number of policies sold reduces from 800 to 700. Calculate the price elasticity of demand (PED) between these two points (ie arc elasticity) using:
    (i) the original method
    (ii) the average method.
37. Write a short note on incentives in market.
38. Briefly explain about price elasticity of demand.

Section C

[Answer any one. Each question carries 10 marks]   (1x10=10 marks)

39. Discuss the determinants of supply and demand
40. Discuss utility and insurance.

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III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN208 : Life Contingencies

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

21. Define gross premium.
22. Define principle of equivalence.
23. Write down the equation of value for a whole life assurance. Assume that premiums are payable m times per year.
24. Define Prospective reserve.
25. Define mortality profit.
26. What do you understand by competing risks?
27. Define reinsurance policy.
28. Define future life time.
29. What do you mean by retrospective reserve?
30. Define central rate of mortality.
31. Explain what $S_{29}(36)$ represents.
32. Define insurable interest.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

33. Explain Gross future loss random variable for a whole life assurance.
34. Andy, aged 40, purchases a single premium whole life annuity of £8,400 pa payable monthly in advance from age 60. Initial expenses are 2% of the premium and renewal expenses are £60 pa from Year 2 onwards, including during payment of the annuity, assumed incurred annually in advance throughout. Calculate the reserve for Andy's policy at the end of the tenth policy year. Assume interest of 4% pa, mortality AM92 Ultimate in deferment and PMA92C20 from age 60.
35. What are the conditions for Equality of prospective and retrospective reserves and show that they are equal by choosing whole life assurance.
36. Briefly explain Net premium reserves for conventional whole life assurance without profit contracts
37. Describe mortality profit on a single policy
38. Briefly explain health insurance contracts.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

39. A 25-year endowment assurance policy provides a payment of £75,000 on maturity or at the end of the year of earlier death. Calculate the annual premium payable for a policyholder who effects this insurance at exact age 45. Expenses

are 75% of the first premium and 5% of each subsequent premium, plus an initial expense of £250.

Assume AM92 Select mortality and 4% pa interest.

40. a) Explain Multiple decrement model with the help of a suitable example

b) Write a note on multiple decrement probabilities.

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN109 : Basic statistics

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Distinguish between primary and secondary data.
2. Define Population & Sample
3. Define Simple Random Sampling
4. Distinguish between Census and Sampling
5. Define dispersion.
6. How will you compute mode for a frequency distribution?
7. Define Random Experiment. Write down the sample space for the random experiment of tossing a coin three times.
8. One card is drawn from a pack of 52 cards. What is the probability that it is either a king or a queen?
9. Draw a histogram for the following data

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	12	30	35	65	45	25	18

10. State addition Theorem

.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. .Distinguish between Sampling and Non Sampling Errors
12. Explain stratified sampling
13. Draw ogives for the following data.Locate the median graphically.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	3	14	22	34	16	7	4

14. Twenty five femur length measurements of aphid pemphigus are as follows.

    3.8, 3.6, 4.3, 3.5, 4.3, 3.3, 4.3, 3.9, 4.3, 3.8, 3.9, 4.4, 3.8, 4.7, 3.6, 4.1, 4.4, 4.5, 3.6, 3.8, 4.4, 4.1, 3.6, 4.2, 3.9

    Prepare a frequency distribution for the above data.

15. The following table gives the heights of students in a class. Find out the Quartile Deviation

Height	No of Students
50-53	2
53-56	7
56-59	24
59-62	27
62-65	13
65-68	3

16. For following distribution of marks of 70 students in a class, obtain the mean and median

Marks	10-20	20-30	30-50	50-60 :	60-70
No of Students	4	16	30	18	2

17. A town has two doctors A and B operating independently. If the probability that doctor A available is 0.9 and that for B is 0.8. What is the probability that at least one doctor is available when needed?
18. You need eggs to make omelets for Breakfast. You find a dozen eggs in refrigerator, but do not realize that two of them are rotten. What is the probability that of the four eggs you choose at random : (i) None is rotten (ii) exactly one is rotten

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.Price of a particular commodity in 5 years in two cities are given below

Price in city A : 22 24 19 21 17

Price in city B : 18 20 18 15 19

Find from the above data the city which has more stable price

20.Probability that a man will be alive 25 years is 0.3 and the probability that his wife will be alive 25 years is 0.4. Find the probability that 25 years hence

(i) both will be alive

(ii) only the man will be alive

(iii) Only the woman will be alive

(iv) none will be alive

(v)at least one of them will be alive

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN109 : Statistical Inference I

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Comment on the following

   " For a poisson distribution, Mean=8 and Variance=7"

2. Define Binomial Distribution
3. If $X \sim N(8, 2^2)$, find P(X>8)
4. What is the test statistic used and its distribution in a large sample test of equality of means of two populations when population variances are known?
5. Define significance level and power of a test in testing of hypotheses.
6. Define Simple Hypothesis with an example.
7. Define critical region.
8. If X is the standard normal random variable, identify the probability distribution of X^2?
9. Define t distribution.
10. What do you mean by degrees of freedom?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11 In a coin tossing experiment, let *p* be the probability of getting a head. The coin is tossed 10 times to test the hypothesis H0 : *p* = 0.5 against the alternative H1 : p = 0. 7 Reject H0, if 6 or more tosses out of 10 result in head. Find significance level and power of the test.

12. Explain the small sample test of equality of the means of two populations.

13. In a sample of 600 men from city A, 450 are found to be smokers. Out of 900 from city B, 450 are smokers. Do the data indicate that the cities are significantly different with respect to the habit of smoking?

14**. .** Explain the Chi-square test of independence.

15..Following is a data collected on two two characters ie Cinima goers and literacy

	Cinema goers	Non Cinema goers
Literates	70	40
Illiterates	30	50

Based on this, can you conclude that there is no relation between the habit of cinema going and literacy

16 For a normally distributed population 7% of the items have their value less than 35 and 87% have their values less than 63. Find the mean and standard deviation of the distribution

17. Out of 800 families with 4 children each, how many would you expect to have (i) 2 boys (ii) either 3 or 4 boys.Assume boys and girls are equally probable in that society.

18**.**What are the applications of t distribution?

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

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

(ii) The theory predicts the proportion of beans in the four groups A. B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882,313,287 and118. Does the experimental result support the theory?

20.(i) Explain paired t test

(ii) .The difference in scores obtained by two players in 11 game 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

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III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN209 : Statistical inference II

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.Define ANOVA

2.Write down the model for one way ANOVA

3.Give any two situations in which we use nonparametric tests.

4.Define Kruskal wallis test statistic.

5.What are the two regression lines ?

6.If the mean of X is 65, mean of Y is 67 , S.D of X=7.5 ,S.D of Y=3.5 and r= 0.8 , find x corresponding to Y=75

7.If the regression coefficients are -0.9 and -0.4 , find the correlation coefficient

8.Define Karl Pearson's Correlation Coefficient .

9.How do you make inferences about correlation from scatter diagram?

10.Define F Statistic.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11.Explain two way ANOVA

12.Explain Mann Whitney U Test

13.The two lines of regression are 8X-5Y +14=0 and 24X-7Y-5=0 Identify the regression lines

14. Calculate Pearson's coefficient of Correlation for the following data

X	10	12	13	16	17	20	25
Y	19	22	26	27	29	33	37

15.What are the different types of Correlation?

16.Following are the responses to the question:' How many hours do you study before a major mathematics test?

6, 5,1, 2, 2, 5, 7, 5, 3,7, 4,7 use the Wilcoxon signed -Rank Test to test the hypothesis at 5% level of significance that the median no of hours of study before a major mathematics test is 3 hours

17.Explain F Test for testing the equality of variances

18.Obtain the Regression lines for the data $(x_1, y_1), (x_2, y_2)\ldots(x_n, y_n)$

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.Find the regression lines for the following data. Also predict the value of Y Corresponds to x=90

X	60	64	67	68	69	70	75	83
Y	65	68	65	69	80	79	74	85

20.A tea company appoints four salesmen A, B, C and D and observes their sales in three seasons-summer, winter and monsoon. The figures (in lakhs) are given in the following table : Perform a two way ANOVA

Season	Salesmen			
	A	B	C	D
Summer	36	36	21	35
Winter	28	29	31	32
Monsoon	26	28	29	29

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN110 : Statistics for critical thinking I

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Explain qualitative and quantitative studies in social science research. Provide examples of each.

2. Discuss the types of variables used in social science research.

3. Differentiate between explanatory and response variables.

4. Compare and contrast observational studies and experiments.

5. Explain the concept of confounding variables in observational studies.

6. Discuss the four main sampling methods used in research.

7. What is a randomized experiment, and how is bias reduced in human experiments.

8. Explain the concept of dispersion in a dataset.

9. What are box plots, and how are they used to represent data?

10. Describe the characteristics of histograms and their significance in data analysis.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Discuss the principles of experimental design in research.

12. You are given the following dataset representing the ages of 10 participants in a study: 25, 28, 30, 35, 40, 42, 45, 50, 55, 60. Calculate the mean and standard deviation of the ages. Explain the significance of these measures in analyzing the dataset.

13. Explain the concept of weighted mean and its significance in data analysis.

14. A study was conducted to measure the effectiveness of two different teaching methods on student performance. The results are as follows:

Method A: Scores of 80, 85, 88, 75, 82.

Method B: Scores of 78, 86, 90, 79, 84.

Calculate the mean and standard deviation for each method. Based on these results, discuss which teaching method appears to be more effective and why.

15. Describe the significance of quartiles in analyzing numerical data.

16. In a survey conducted among 50 individuals, the following data was collected on their monthly income:

Mean income: Rs 5000

Standard deviation: Rs1000.

Calculate the coefficient of variation for the income data and interpret what it indicates about the income distribution among the surveyed individuals.

17. Define the concept of a mosaic plot and its application in data visualization.

18. Explain the significance of pie charts in representing categorical data.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Compare and contrast in detail different sampling principals and strategies in research.

20. A research study collected data on the weights of two groups of participants before and after a weight loss intervention. The data is as follows:

Group A (Before intervention): 70 kg, 75 kg, 80 kg, 85 kg, 90 kg

Group A (After intervention): 65 kg, 70 kg, 75 kg, 80 kg, 85 kg

Group B (Before intervention): 60 kg, 65 kg, 70 kg, 75 kg, 80 kg

Group B (After intervention): 55 kg, 60 kg, 65 kg, 70 kg, 75 kg

a) Calculate the mean weight and standard deviation for both Group A and Group B before and after the intervention. b) Calculate the coefficient of variation for both groups before and after the intervention. c) Interpret the coefficient of variation results for each group in the context of the weight loss intervention and discuss which group shows more variability in weight change.

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN110 : Statistics for critical thinking II

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What are the different methods of data collection? Give a brief explanation of each.

2. Explain the process of cleaning data and suggest one method to check the reliability of data.

3. Define probability and provide an example of disjoint or mutually exclusive outcomes.

4. In a survey, 150 people were asked about their favorite color. 45 people chose blue, 30 chose red, 25 chose green, and the rest chose other colors. Calculate the probabilities of choosing red or green as the favorite color.

5. What is conditional probability, and how is it calculated using contingency tables?

6. Define random variables and explain the concept of variability in random variables.

7. In a binomial distribution with $n = 10$ and $p = 0.3$, calculate the probability of getting exactly 3 successes.

8. Explain the standard normal distribution and its applications

9. Explain Poission distribution and its applications.

10. The number of daily visitors to a website follows a Poisson distribution with an average of 100 visitors per day. Calculate the probability that there will be fewer than 90 visitors on a given day.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Define random variables and discuss their variability, linear combinations, and expectations.

12. A group of 10 students is participating in a quiz competition. In how many ways can the top 3 positions be awarded with a first, second, and third place.

13. In a class, 60% of students like Mathematics, 50% like Science, and 30% like both subjects. If a student is chosen at random and is found to like Science, what is the probability that they also like Mathematics?

14. A random variable X has the following probability distribution: X = 2 with probability 0.3 X = 4 with probability 0.5 X = 6 with probability 0.2. Calculate the expectation of the random variable X.

15. Differentiate between the geometric distribution, negative binomial distribution, and discuss the differences between binomial and negative binomial distributions.

16. A basketball player makes a free throw with a probability of 0.8. What is the probability that the player misses the first two free throws and makes the third one?

17. The number of cars passing through a toll booth follows a Poisson distribution with an average of 20 cars per hour. Calculate the probability that 25 cars pass through the toll booth in an hour.

18. The heights of students in a school are normally distributed with a mean of 160 cm and a standard deviation of 10 cm. What is the probability that a randomly selected student is shorter than 150 cm?

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. A survey was conducted on the preferences of ice cream flavors among children. The results are as follows: 60% like chocolate, 40% like strawberry, and 30% like both flavors.

i) What is the probability that a randomly chosen child likes chocolate given that they like strawberry?

ii) Using Bayes' Theorem, find the probability that a child likes strawberry given that they like chocolate.

20. The scores of students on a standardized test follow a normal distribution with a mean of 75 and a standard deviation of 10.

i)Calculate the probability that a randomly selected student scores below 80.

ii)Determine the probability that a randomly selected student scores between 70 and 85.

iii)If the top 10% of students receive a special award, what is the minimum score required to receive the award

iv)Calculate the interquartile range (IQR) of the scores distribution.

v)If the mean score is increased by 5 points, what is the new probability that a student scores above 80?

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III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN210 : Statistics for critical thinking III

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Explain the concept of sampling variability, sampling error and bias.

2. What is the Central Limit Theorem and how is it applied in real-world settings?

3. Discuss the importance of Confidence Intervals in statistical inference.

4. Explain the process of Inference for a Single Proportion.

5. How is the sample size chosen when estimating a proportion?

6. Define One-Sample Means with the t-distribution.

7. Conduct a one-sample t-test with a sample mean of 35, a sample standard deviation of 6, and a null hypothesis mean of 30.

8. Define Residuals and explain their role in linear regression analysis.

9. Discuss the importance of Correlation in describing linear relationships.

10. Interpret the R-squared value of 0.85 in a linear regression model with a categorical predictor.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Explain the difference between Type I and Type II errors in Hypothesis Testing.

12. A survey shows that 60 out of 100 participants prefer Product A. Test at 5% significance level if the population proportion differs from 0.5.

13. Discuss the concept of Hypothesis Testing for the Difference of Two Proportions.

14. Explain the process of Testing for Goodness of Fit using chi-square

15. Discuss the hypothesis tests for the Difference of Two Means.

16. Explain the Analysis of Variance (ANOVA) and role of F-test.

17. Explain the process of Fitting a Line in linear regression analysis.

18. Given a set of data points (x, y): (1, 2), (2, 4), (3, 6), (4, 8), calculate the least squares regression line.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Analyze the process of Testing for Independence in Two-Way Tables using the chi-square test

20. What is Linear Regression?. Explain in detail the estimation of regression coefficients using principal of ordinary least squares.

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN111 : ELEMENTARY STATISTICS

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Differentiate between internal and external data.

2. Define correlation.

3. Construct a frequency table for the following data using tally marks: 21, 28, 25, 24, 26, 27, 29, 28, 24, 25, 23, 21, 24, 27, 28, 21, 26, 23, 25, 24, 28, 29, 21, 27, 25, 26, 23, 24, 28, 21

4. Calculate Geometric mean of 2, 5, 3, 5, 7

5. Define regression.

6. What are the merits of arithmetic mean?

7. What is meant by metadata.

8. What is meant by central tendency?

9. Differentiate between classification and tabulation

10. What are regression coefficients?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. What are the basic principles for forming a grouped frequency distribution.

12. The following are the prices of shares of company ABC from monday to Saturday.

Day	Price	Day	Price
Monday	200	Thursday	152
Tuesday	230	Friday	240
Wednessday	217	Saturday	211

Calculate range.

13. Differentiate (i) qualitative and quantitative data (ii) validity and precision.

14. Present the following data of marks in Statistics for 60 students in the form of frequency table with 10 classes of equal width.

41	52	28	89	38	74	89	65	42	32
33	67	100	85	54	84	89	36	41	10
60	82	45	74	15	87	83	45	62	37
57	95	59	25	14	19	25	83	92	98
60	36	65	65	100	32	34	92	90	63
5	74	78	56	86	89	63	75	82	88

15. Define regression lines and regression coefficients.

16. Calculate mode of the following data:

Class	10-20	20-30	30-40	40-50	50-60	60-70
f	18	24	7	12	9	31

17. Blood serum cholestrol levels of 10 persons are: 240, 260, 290, 245, 255, 288, 272, 263, 277, 251. Calculate standard deviation.

18. In a sample study about coffee drinking habit of people in two towns, the following information was received:

Town A: Females were 40%, total coffee drinkers were 45% and male non coffee drinkers were 20%

Town B: Males were 55%, male non coffee drinkers were 30% and female coffee drinkers were 15%

Represent the above data in a tabular form.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Calculate arithmetic mean and median of the following data:

Income (Rs.)	15000	18100	25500	52100	35000	46000
Number of persons	29	12	49	31	19	10

20. Calculate correlation coefficient for the following data:

Roll number of students	1	2	3	4	5
Marks in X	47	25	49	34	39
Marks in Y	50	32	45	41	47

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN111 : THEORY OF PROBABILITY

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define discrete and continuous random variable.

2. Define independence.

3. Define normal distribution.

4. X → $N(12, 16)$. Find P(X>20).

5. Differentiate between census and sampling.

6. Define a random variable.

7. Define systematic sampling.

8. Define probability density function for continuous random variable.

9. Define classical definition of probability.

10. Derive mean of binomial distribution.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. State and prove addition theorem on probability.

12. Four unbiased coins are tossed. Let X denotes the number of heads minus the number of tails. Find the probability distribution of X and P($-2 \leq X < 3.5$).

13. Two unbiased dice are thrown. Let A denote the event that the sum of the numbers shown on the faces is odd and B denote the event that 'atleast one die shows the face with the number 1'. (i) describe the complete sample space (ii) find $A \cap B^c$.

14. For a random variable X following B(6, p) given 9P(X=4)=P(X=2). Find p.

15. Define distribution function and write any three properties.

16. What is puposive sampling. Explain with an example.

17. The probability that an individual suffers a bad reaction from a medicine is 10004. Out of 2000 individuals admitted the medicine, find the probability that (i) exactly 5 (ii) more than 2 suffers from bad reaction.

18. Write the sample space of the following random experiments and identify whether they are discrete or continuous:

(a) two dice are rolled and noting the absolute value of the difference of the numbers shown.
(b) Counting the number of vehicles passing through a bridge near your college between 11 AM to 1 PM
(c) Noting the time required for your college bus to cover the first 10 kilometers in evening trip.
(d) Measuring the weight of a new born baby in normal delivery.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Given that f(x)= $\frac{k}{2^x}$, $x = 0,1,2,3,4$. Find (i) k (ii) distribution function.

20. Define mathematical expectation. Write any two properties of it. Find the expected number of heads in four tosses of an unbiased coin.

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III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN211 : STATISTICAL INFERENCE

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define statistic and parameter.

2. Write the probability density function of Chi square distribution.

3. Differentiate between simple and composite hypothesis.

4. Define consistent estimator.

5. Differentiate between point and interval estimation.

6. Write any two applications of Chi square distribution.

7. Define type II error.

8. What is sampling distribution?

9. What are the desirable properties of a good estimator.

10. What are the conditions for validity of Chi square test.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. State central limit theorem.

12. Explain large sample test of testing the mean of a population when standard deviation os known.

13. Four coins are tossed 640 times and the following results on the total number of heads are noted. Can we conclude the hypothesis that the coins are unbiased.

No of heads	0	1	2	3	4
No of trials	32	169	223	182	34

14. Prove or disprove that unbiased estimator is unique.

15. In a die throwing experiment the throw of 4 or 6 is considered as a success. Suppose 9000 times the die was thrown and resulted in 3240 successes. Is the data support the claim that the die is unbiased.

16. Prove or disprove that sample variance is a consistent estimator of population variance.

17. What are the principles of sampling.

18. A group of 200 boys and 100 girls are selected for an IQ test and they are classified as given below. Examine whether there is any dependency between the intelligence levels and the gender.

	Below average	Average	Above average	Genius	Total
Boys	86	60	44	10	200
Girls	40	33	25	2	100
Total	126	93	69	12	300

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Find the probability of type I error of the test which rejects H_0 if x > 1-α in favor H_1 if X has pdf of the form f(x) = $\theta x^{\theta-1}, 0 < x < 1$ with H_0: $\theta = 1$ and H_1: 2. Find the size and power of the test.

20. Write the procedure to find the confidence interval for the mean of a normal population with confidence coefficient (1-α).

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN112 : BASIC STATISTICS AND DATA VISUALIZATION

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What is the mean of the following set of scores 13,25,70,19,37,42?
2. Calculate Median and Mode of the following data: 13,25,70,13,37,42
3. Explain types of data.
4. Differentiate questionnaire and schedule.
5. How do you convert inclusive class to exclusive class interval?
6. What are the different shapes of the frequency curve?
7. What you mean by histogram.
8. What is qualitative and quantitative data?
9. What is questionnaire?
10. What is secondary data?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Explain various methods of collecting primary data.

12. Calculate A.M and Median from the following data:

Value	5	15	25	35	45	55	65	75
Frequency	15	20	25	24	12	31	71	52

13. Find Harmonic mean and Geometric mean from the following data:

Class:	10-20	20-30	30-40	40-50	50-60

f :	4	6	10	7	3

14. Find Harmonic mean and Geometric mean from the following data:

Class:	10-20	20-30	30-40	40-50	50-60
f :	4	6	10	7	3

15. Find Standard deviation from the following data. Also find variance and coefficient of variation.

Size :	0-2	2-4	4-6	6-8	8-10	10-12
Frequency:	2	4	6	4	2	6

16. Explain measures of central tendency.

17. Explain the measures of dispersions.

18. Draw the two ogive for the following data

Marks :	10-19	20-29	30-39	40-49	50-59
No.of students :	5	10	18	12	5

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Find mean,median and mode for the following data. Also verify the empirical relation.

Class :	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency :	5	12	18	24	17	15	9

20. Obtain quartile deviation and standard deviation for the following data. Also find coefficient of Q.D and coefficient of variance.

Class :	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency :	5	9	20	31	18	11	6

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN112 : DATA ANALYSIS FOUNDATIONS IN STATISTICS

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define correlation.
2. Define regression.
3. Define Scatter diagram.
4. Define Principle of least squares.
5. How to find Karl Pearson's correlation coefficient?
6. Write down the normal equations to fit a straight line Y=a+bX.
7. What is rank correlation?
8. What is seasonal variation?
9. What is time reversal test?
10. What is simple interest?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Define time series. Explain the components of time series.
12. What are time reversal and factor reversal tests in index numbers?
13. Explain different methods of measuring correlation.
14. Describe briefly the various methods of determining seasonal variation in a time series.
15. Explain 1) simple Interest 2) Compound Interest 3) A.P 4) G.P
16. Explain the methods of moving average of obtaining trend in a time series. Mention its merits and demerits.
17. What is index number? What are the uses of index numbers?

18. Explain the method of least squares method of obtaining linear trend in a time series.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Compute Laspeyre's Paasche's and Fisher's index numbers using the following data.

Commodity	price		quantity	
	1970	1980	1970	1980
X	4	10	50	40
Y	2	8	10	5
Z	3	7	5	5

20. For the following time series, obtain quadratic trend by the method of least squares and estimate the value in 1990?

Year :	1980	1981	1982	1983	1984	1985	1986
Value:	4	6	10	18	32	51	70

****

III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN212 : PROBABILITY THEORY AND SAMPLING TECHNIQUES

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. Define classical definition of probability.
2. What is the probability of getting a spade and an ace from a pack of cards?
3. State addition theorem of probability.
4. What is crude birth rate?
5. Define infant mortality rate.
6. Define couple protection ratio.
7. The mid-year population of a city in an year was 5,67,600. If there were 10989 births, compute crude birth rate.
8. What are large and small samples?
9. What is statistical quality control?
10. What are assignable causes?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. What is np chart? What are the procedures for the construction of np chart?

12. What is mean chart? What are the procedures for the construction of mean chart?

13.Explain the method of selecting a systematic sample.

14. What are the merits and demerits of simple random sampling.

15. How do you select a random sample using random number table?

16. The population of a locality is 60780. The population of women of child bearing age is 15350. If 1550 children were born in the year, find the crude birth and general fertility rates.

17. If A and B are mutually exclusive events and if P(A)=0.5 and P(B)=0.3. Find

i) $P(A\cup B)$ ii) $P(A\setminus B)$ iii) $P(A^c\cap B^c)$

18.The probabilities of two students A and B solving a problem are 1/2 and 1/4 respectively. If both of them independently try, what is the probability that the problem is solved?

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. A committee of 5 people is to be formed randomly from a group of 10 women and 6 men. Find the probability that the committee has

i) Three women and two men.

ii) Five women.

iii) Atleast 3 women.

20. What is quality control? Explain the control charts for attributes.

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1MN113 : FUNDAMENTALS OF DATA ANALYSIS

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What is the mean of the following set of scores 13,25,70,19,37,42?
2. Calculate Median and Mode of the following data.

   13,25,70,13,37,42

3. Explain types of data.
4. Differentiate questionnaire and schedule.
5. How do you convert inclusive class to exclusive class interval?
6. What are the different shapes of the frequency curve?
7. Write R code of histogram.
8. What is qualitative and quantitative data?
9. What is questionnaire?
10. Write R code of Pie Chart.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Explain various methods of collecting primary data.

12. Calculate A.M and Median from the following data:

Value	5	15	25	35	45	55	65	75
Frequency	15	20	25	24	12	31	71	52

13. Find Harmonic mean and Geometric mean from the following data:

Class:	10-20	20-30	30-40	40-50	50-60

f :	4	6	10	7	3

14. Find Harmonic mean and Geometric mean from the following data:

Class:	10-20	20-30	30-40	40-50	50-60
f :	4	6	10	7	3

15. Find Standard deviation from the following data. Also find variance and coefficient of variation.

Size :	0-2	2-4	4-6	6-8	8-10	10-12
Frequency:	2	4	6	4	2	6

16. Write R code of any two graphs.

17. Explain the measures of dispersions.

18. Draw the two ogive for the following data

Marks :	10-19	20-29	30-39	40-49	50-59
No.of students :	5	10	18	12	5

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19. Find mean, median and mode for the following data. Also verify the empirical relation.

Class :	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency :	5	12	18	24	17	15	9

20. Write the R code of Mean, median and mode?

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2MN113 : STATISTICAL MODELING AND SAMPLING TECHNIQUES

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What is meant by Measure of skewness?
2. What is scatter diagram
3. List any two limits of Pearson's correlation coefficient
4. What is meant by regression analysis
5. Write the simple random sampling with replacement?
6. Define sampling errors.
7. What are the differences between correlation and regression
8. What is Kurtosis?
9. What is Census Method?
10. How we find rank correlation for untied data?

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Explain preparation of questionnaire.
12. Write R code of standard variation.
13. Write R code of correlation.
14. For the following data, compute the two regression equations and also find the value of correlation coefficient

X	2	3	6	4	5	4
Y	1	3	4	2	5	3

15. Explain organization and execution of large sample survey.

16. Explain in Principal steps in Sample survey.

17. Find Skewness

X	21	30	61	42	51	47
Y	11	31	48	20	58	33

18. What are the properties of regression coefficients? Explain rank correlation.
19. Explain Lottery method. Explain stratified random sampling.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19. Explain Different Random sampling methods.

20. Check whether the following can be regression equations. If so find

1) regression coefficient
2) correlation coefficient
3) mean

$1.2X+0.9Y=16$

$0.8X+1.08Y=10$

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III Semester B.Sc. (CUFYUGP) Degree Examinations October 2025

STA3MN213 : PROBABILITY THEORY AND STATISTICAL DISTRIBUTIONS

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1. What is normal distribution?
2. What is Random Variable
3. List any two properties of exponential distribution.
4. Write the R code of Cumulative distribution.
5. Write the sample space of the experiment of coin tossing experiment until head appears
6. Define events
7. What are the differences between pmf and pdf
8. Define probability mass function
9. List the properties of distribution function
10. Write R code of Density function

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11. Define distribution function. What are its properties?
12. Four unbiased coins are tossed. Let X denote the number of heads minus the number of tails. Find the probability distribution of X and $P(-2<X<3.5)$?
13. Given a discrete random variable X with p.m.f.

x	0	1	2	3	4
f(x)	0.2	k	2k	k/2	0.1

Find the value of k? Also find $P(0.5<X<2.5)$

14. Write the R code of curves of binomial distribution

15. Explain axiomatic approach to probability

16. The probabilities of A and B solving a problem are 0.5 and 0.6 respectively. What is the probability that the problem is solved if they solve it independently? What is the probability that the problem is not solved?

17. Explain the properties of normal distribution.

18. State the addition theorem for two events. In an examination, 30% of the students have failed in Mathematics, 20% failed in Chemistry and 10% in both Mathematics and Chemistry. A Student is selected at random. What is the probability that the student has failed either in Maths or Chemistry.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

19. For a random variable X with possible values -3,-2,-1,0,1,2 and 3 given $P(X=-3)=P(X=-2)=P(X=-1)$;$P(X=3)=P(X=2)=P(X=1)$ and $P(X=0)=P(X>0)=P(X<0)$. Obtain the probability distribution of X and its distribution function.

20. Explain any three continuous distributions.

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FOUNDATION COURSES

MODEL QUESTION PAPERS

I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1FM101 Quality Control (credits: 3)

Maximum Time: 1.5 hours Maximum Marks: 50

Section A

[Answer All. Each question carries 2 marks] (Ceiling 16 marks)

1. Define quality of a product.
2. State how variation between and within samples are assessed?
3. Distinguish between variables and attributes.
4. Define Process and Product control.
5. Define Control Charts.
6. State the CL, UCL and LCL of Standard Deviation Chart.
7. Distinguish between “defects” and “defective”.
8. Define AQL and LTPD
9. Define AOQ and AOQL
10. Define Producers Risk and Consumers Risk

Section B

[Answer All. Each question carries 6 marks] (Ceiling 24 marks)

11. Briefly explain various causes of variation.
12. Explain how statistical control is assessed using control charts.
13. Explain construction of C Chart.
14. Explain Sampling Inspection Plans.
15. Discuss the errors in Sampling Inspection Plans.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

16. The following data gives number of defectives observed in samples of size 100 taken from a production process. 12, 10, 9, 14, 11, 7, 10, 8, 12, 15. Construct proportion defective chart and verify the process control
17. The following data gives mean and range of samples of size 7 taken from a production process.

Sample	1	2	3	4	5	6	7	8	9
Mean	47.8	46.3	49.0	50.4	48.2	50.7	46.5	51.2	50.0
Range	6	9	5	3	4	5	7	6	3

Construct suitable control charts and verify process control.

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA1FM102: Fundamentals of Statistics

(credits: 3)

Maximum Time: 1.5 hours **Maximum Marks: 50**

Section A

[Answer All. Each question carries 2 marks] (Ceiling 16 marks)

1. Define Statistics?.

2. What is the difference between population and Sample?

3.What is pi-diagram?

1. Explain the terms (a) class interval (b) class frequency
2. Define Median.
3. Calculate the harmonic mean of 3,5,1,7,4,6,10,9
4. Define Mean deviation.
5. Calculate the range of 10,25,26,52,46,13

9. What is leptokurtic curve?

10. Distinguish between positive and negative skewness

Section B

[Answer All. Each question carries 6 marks] (Ceiling 24 marks)

11. What are the different diagrammatic representations of data? Explain.

12.What is a histogram? How will you construct it?

13.The marks obtained by 25 students are given below. Find the GM and HM

Values:	11	12	13	14	15
Frequency	3	7	8	5	2

14. Compute the quartile deviation from the data

Marks:	10	20	30	40	50	60
No of students	4	7	15	8	7	2

15. What do you mean by Skewness? Find the Karl pearson coefficient of skewness from the follaowing data

Marks:	10	25	30	45	50	65
No of students	8	12	20	10	7	3

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

16. What is mode? Compute Mode for the following data

Age:	15-19	20-24	25-29	30-34	35-39	40-44
No of person	420	38	24	10	4	

17. Define standard deviation. Calculate the Standard deviation for the following data.

class:	5-10	10-15	15-20	20-25	25-30	30-35	35-40
frequency	10	14	40	60	50	46	20

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II Semester B.Sc. (CUFYUGP) Degree Examinations March 2025

STA2FM103 : Managerial Decision Making (credits: 3)

Maximum Time: 1.5 hours　　　　Maximum Marks: 50

Section A

[Answer All. Each question carries 2 marks] (Ceiling 16 marks)

1. Define decision alternatives and states of nature.
2. Define pay off and pay off matrix
3. Define EMV
4. Define Inventory
5. Define EOQ
6. Define Game
7. Define saddle point
8. Define zero sum game
9. Define simulation
10. Define pure and mixed strategy

Section B

[Answer All. Each question carries 6 marks] (Ceiling 24 marks)

11. Explain various decision making environments
12. Consider the following stock demand of a shop. The purchase cost is Rs. 50/- and selling price is Rs, 60/-. Construct profit table and EMV if the probabilities of demands are in the ratio 2:3:1:4

Stock ↓Demand→	10 units/week	15 units/week	20 units/week	25 units/week
10 units/week				
15 units/week				
20 units/week				
25 units/week				

13. Explain the need of maintaining inventories.
14. Explain Monte Carlo Simulation.
15. Explain the principle of Dominance in solving games.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

16. Explain various parameters of Inventory. Discuss the difference between inventories with and without lead time
17. Solve the following game

Player A ↓Player B →	B1	B2	B3
A1	7	5	9
A2	4	2	6
A3	5	8	7

I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

STA2FM104 : Statistical Sampling and Probability

(credits: 3)

Maximum Time: 1.5 hours **Maximum Marks: 50**

Section A

[Answer All. Each question carries 2 marks] (Ceiling 16 marks)

1. What do you mean by a population?

2. What is sampling error and non sampling error?

3. Define census method.

4. What are the advantages of sampling over census?

5. How will you select a stratified random sample?

6. Define simple random sampling without replacement

7. Define systematic sampling.

8. Define random experiment

9. Define conditional probability

10. Given P(A)=0.30, P(B)= 0.78. Find P(A'UB')

Section B

[Answer All. Each question carries 6 marks] (Ceiling 24 marks)

11. Write any five steps for preparation of questionnaire

12. Distinguish between systematic sampling and cluster sampling.

13. Define classical and axiomatic definition of probability theory.

14. Define (1) Mutually exclusive event (2) Exhaustive event (3) Equally likely event

15. Define conditional probability of two events.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

16. Describe simple random sampling and stratified random sampling with example

17. If A and B are two events such that P(A) = $\frac{1}{3}$, P(B) = $\frac{1}{4}$, and P(A intersection B) = $\frac{1}{8}$. Find P(A|B) and P(A|B')

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