

FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2020

Statistics

STA 1C 03—DESCRIPTIVE STATISTICS (FOR GEOGRAPHY)

(2019 Admissions)

Time : Two Hours

Maximum : 60 Marks

Use of Calculator and Statistical table are permitted.

Section A (Short Answer Type Questions)

*Answer at least **eight** questions.*

Each question carries 3 marks.

All questions can be attended.

Overall Ceiling 24.

1. Define sampling frame and sampling unit.
2. Sketch a frequency polygon to the following data :

Class	0–10	10–20	20–30	30–40	40–50
Frequency	6	12	20	15	8

3. Write any two advantages of stratified random sampling.
4. Define secondary data and point out its sources.
5. Point out any *two* demerits of arithmetic mean as a measure of average.
6. Define partition values.
7. Find the second quartile of the following set of 8 values :
12, 14, 11, 10, 15, 18, 16, 8.
8. Define Range.
9. Find the mean deviation about mean of 10, 16, 14, 12, 4 and 10.
10. Show that the first central moment is always zero.

Turn over

11. Define Symmetric distribution.
12. Explain how the kurtosis is measured using moments.

(8 × 3 = 24 marks)

Section B (Short Essay/Paragraph Type Questions)

Answer at least five questions.

Each question carries 5 marks.

All questions can be attended.

Overall Ceiling 25.

13. Explain the methods of collecting primary data.
14. Explain random and non-random sampling with suitable examples.
15. Calculate 6th decile of the following data :

Class	10–30	30–50	50–70	70–90	90–110
Frequency	6	14	23	16	11

16. In a dataset of nine observations three values are 3, three values are 6, and three values are 9. Calculate the mean, and variance for the data. What will be the mean and variance if one more 3 and one more 9 are added to the data ?
17. Calculate quartile deviation of the following data :

Class	0–10	10–20	20–30	30–40	40–50
Frequency	9	14	23	17	13

18. Define co-efficient of variation. Calculate the co-efficient of variation for the following frequency distribution :

Class	5–15	15–25	25–35	35–45	45–55
Frequency	4	12	16	18	10

19. Given the first four raw moment of a set of data as 3, 18 and 68 and 600. Find second, third and fourth central moments.

(5 × 5 = 25 marks)

Section C (Essay Type Questions)

*Answer any **one** question.*

The question carries 11 marks.

20. (i) Define Sampling and census. Explain the advantages of sampling over census.
(ii) Explain the methods of (a) Cluster ; and (b) Multistage sampling.
21. Explain Skewness. Calculate Bowley's co-efficient of skewness for the following data :

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	6	13	24	27	16	14

(1 × 11 = 11 marks)

CHMK LIBRARY UNIVERSITY OF CALICUT

FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION, NOVEMBER 2020

Statistics

STA 1C 02—DESCRIPTIVE STATISTICS (FOR PSYCHOLOGY)

(2019 Admissions)

Time : Two Hours

Maximum : 60 Marks

*Use of calculator and Statistical table are permitted.***Section A (Short Answer Type Questions)***Answer at least **eight** questions.**Each question carries 3 marks.**All questions can be attended.**Overall Ceiling 24.*

1. Define primary and secondary data.
2. Differentiate discrete and continuous data.
3. Define time series data.
4. What are the common forms of data classification ?
5. Define geometric mean.
6. Arithmetic mean of first 10 observations is 12 and that of the next 20 observations is 15. Find the combined mean of these two sets.
7. Write any two advantages and limitations of mode as a measure of central tendency.
8. Define dispersion.
9. Find the mean deviation about the median of the values, 12, 10, 14, 15, 13, 18, 16.
10. Sum of squares of 12 observations are 156 and their mean is 3. Calculate the standard deviation of the observations.
11. Define relative measures of dispersion and co-efficient of variation.
12. Find the co-efficient of skewness of a set of data with first three quartiles 2, 6 and 14 respectively.

(8 × 3 = 24 marks)

Section B (Short Essay/Paragraph Type Questions)*Answer at least **five** questions.**Each question carries 5 marks.**All questions can be attended.**Overall Ceiling 25.*

13. Explain the steps involved in drawing a pie diagram.

Turn over

14. Write a short note on frequency distribution.
15. Construct a frequency polygon for the following data on the ages of patients admitted in a hospital last week :

Age	0-20	20-40	40-60	60-80	80- 100
Patients	14	10	18	22	4

16. Find an appropriate measure of central tendency to the following data :

Class	Below 20	20-30	30-40	40-50	Above 50
Frequency	9	21	12	6	2

17. Following is the data obtained on a survey on the ages of persons suffering from viral fever.

(i) Under what age 80% of the patients belong to ?

(ii) Above what age 35% of the patients belong to ?

Age	0-15	15-30	30-45	45-60	60-75	75-90	90 and above
Patients	14	26	12	18	15	10	5

18. Explain the method of finding combined standard deviation of two sets of observations where, number of observations in each set, their means and standard deviations are given.
19. Explain skewness and Pearson's co-efficient of skewness.

(5 × 5 = 25 marks)

Section C (Essay Type Questions)

Answer any **one** question.

The question carries 11 marks.

20. Draw a multiple bar diagram of the following data on the number of AIDS patients identified in two states A and B in last 5 years :

Year	2013	2014	2015	2016	2017	2018
No. of patients in State A	130	90	105	80	65	40
No. of patients in State B	90	100	85	60	50	30

Also calculate the mean number of AIDS patients per year identified in two states A and B in last 5 years.

21. Define kurtosis. Calculate the percentile measure of kurtosis to the following data :

Class	5 - 10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	6	15	18	26	20	12	3

(1 × 11 = 11 marks)

**FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2020**

Statistics

STA 1C 01—INTRODUCTORY STATISTICS

(2019 Admissions)

Time : Two Hours

Maximum : 60 Marks

Use of Calculator and Statistical table are permitted.

Section A (Short Answer Type Questions)

*Answer at least **eight** questions.*

Each question carries 3 marks.

All questions can be attended.

Overall Ceiling 24.

1. Expand NSSO. Write any *two* of its responsibilities.
2. Define primary and secondary data.
3. Define population and sample.
4. For a set of observations, show that sum of deviation of the observations from their arithmetic mean is zero.
5. Define quartiles and quartile deviation.
6. Define outliers in a box plot.
7. What is the variance of a set of values with mean and co-efficient of variation are respectively 20 and 60 % ?
8. Define Scatter diagram.
9. Calculate the coefficient of correlation between x and y , where the regression coefficients are $-\frac{16}{3}$ and $-\frac{1}{12}$.
10. Define time series and write any *two* of its objectives.
11. Define secular trend in a time series.
12. Differentiate price and quantity index numbers.

(8 × 3 = 24 marks)

Turn over

Section C (Essay Type Questions)

Answer any one question.

The question carries 11 marks.

20. Find the median marks of 100 students from the following data. Also locate median graphically by drawing ogives :

Marks	0–10	10–20	20–30	30–40	40–50	50–60	60–70
Students	3	14	22	34	16	7	4

21. (i) Explain the problems while constructing index numbers.
(ii) Explain any *two* weighted price index numbers.
(iii) Show that Fisher's index number satisfies time reversal test.

(1 × 11 = 11 marks)

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FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION, NOVEMBER 2020

Statistics

STA 1B 01—OFFICIAL STATISTICS AND PROBABILITY

(2019 Admissions)

Time : Two Hours and a Half

Maximum : 80 Marks

*Use of calculator and Statistical table are permitted.***Section A (Short Answer Type Questions)***Answer at least ten questions.**Each question carries 3 marks.**All questions can be attended.**Overall Ceiling 30.*

1. What are the main divisions of Statistics wing of MoSPI?
2. Which is the premier institute in India for training in Official Statistics?
3. A set of 10 values has arithmetic mean 26. While calculating this mean the 6th observation was misread as 15 instead of 50. Find the correct mean.
4. For two positive numbers a and b , prove that Arithmetic mean is never less than their Geometric mean.
5. Define harmonic mean.
6. Define partition values.
7. Calculate the regression co-efficient x on y , for two variables x and y with their co-efficient of correlation $r = 0.8$ and the SDs of x and y are 3 and 6 respectively.
8. For three variables x, y and z , co-efficient of correlation between (x, y) , (x, z) and (y, z) are respectively 0.4, 0.8 and 0.6. Find the partial correlation co-efficient between x and y .
9. Define random experiment.
10. Distinguish between Discrete and Continuous sample space.
11. If A and B are independently trying to qualify a test with their respective probabilities to qualify 0.4 and 0.7. Find the probabilities of : (i) both (ii) A or B, to qualify the test
12. For two mutually exclusive events A and B, if $P(A) = 0.5$, $P(B) = 0.3$, find the probability of the happening of at least one of these events.
13. Write any two properties of probability density function.

Turn over

14. Examine whether, $f(x) = \frac{x}{5}, x = 1, 2, 3$, is a probability mass function.
15. Define distribution function of a random variable X .

(10 × 3 = 30 marks)

Section B (Short essay/paragraph type Questions)*Answer at least five questions.**Each question carries 6 marks.**All questions can be attended.**Overall Ceiling 30.*

16. If G_1 and G_2 are the geometric means of two sets of observations contains n_1 and n_2 observations respectively. Obtain an expression for the geometric mean of the combined set.
17. Define percentile. Calculate the 30th and 70th percentiles for the following data :
- | | | | | | |
|-----------|------|-------|-------|-------|-------|
| Class | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 |
| Frequency | 4 | 14 | 16 | 10 | 6 |
18. Stating the principle of least squares, explain the method of fitting a straight line equation between x and y using the observations $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$ on x and y .
19. For two variables x and y , prove that $0 \leq r_{xy} \leq 1$, where r_{xy} is Pearson's co-efficient of correlation.
20. If A and B are two independent events, prove that : (i) A and B^c and (ii) A^c and B are also independent.
21. List out any five properties of the distribution function of a discrete random variable X .
22. If X is a continuous random variable with p.d.f. $f(x) = kx^2, 0 < x < 2; f(x) = 0$, elsewhere, find (i) value of k (ii) $P(X < 0.5)$.
23. If X is a random variable with p.m.f. $f(x) = \frac{e^{-\lambda} \lambda^x}{x!}, x = 0, 1, 2, \dots$; find the p.m.f.s. of (i) $Y = 2X + 5$ (ii) $Y = X^2 - 2$.

(5 × 6 = 30 marks)

Section C (Essay Type Questions)*Answer any two questions.**Each question carries 10 marks.*

24. Define kurtosis. Explain different measures of kurtosis. Calculate the co-efficient of kurtosis based on moments for the following data :

Class	0-10	10-20	20-30	30-40	40-50
Frequency	6	14	16	24	10

25. Explain rank correlation co-efficient. Derive Spearman's co-efficient of rank correlation.
26. State Bayes' theorem. From a bag A containing 4 red and 5 black balls, two balls were transferred to another bag B containing 6 red and 4 black balls. Then two balls drawn randomly from bag B. What is the probability that the balls drawn from bag B are blacks ?
27. The probability density function of a random variable X is given as,

$$f(x) = ke^{-5x}, x \geq 0$$

- (i) Find k .
- (ii) Determine the distribution function of X.
- (iii) Prove that $P(X \geq 7/X \geq 4) = P(X \geq 3)$.

(2 × 10 = 20 marks)

CHMK LIBRARY UNIVERSITY OF CALICUT

**FIRST SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2020**

Statistics

SG 1C 01/GR 1C 01—STATISTICAL METHODS

Time : Three Hours

Maximum : 80 Marks

Section A (One Word Questions)

Answer all questions.

Each question carries 1 mark.

1. _____ is a face to face contact with the investigator and informants.
2. _____ is the middle most data value in a distribution.
3. Semi-inter quartile range is known as _____.
4. _____ is the square root of variance
5. AM of first 'n' natural numbers is _____.
6. _____ is the value which occurs most frequently in a set of observations.
7. Give any two characteristics for an ideal measure of dispersion.
8. Graphical method of analyzing dispersion is _____.
9. _____ is the ideal measure of central tendency.
10. _____ means lack of symmetry.

(10 × 1 = 10 marks)

Section B (One Sentence Questions)

Answer all questions.

Each question carries 2 marks.

11. Define Kurtosis.
12. Give the characteristics of a good average.
13. What are the uses of HM ?
14. Define Percentiles.
15. Give the merits of mean deviation as a measure of dispersion.

Turn over

16. What are the merits and demerits of median ?
17. What are the sources of secondary data ?

(7 × 2 = 14 marks)

Section C (Paragraph Questions)

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

18. What are the limitations of statistics ?
19. Explain the main difference between MD and SD.
20. Find the mode of the following data :

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	8	7	12	28	20	10

21. Explain quartiles and deciles.
22. Obtain the GM of 2, 4, 6, 8, 10.

(3 × 4 = 12 marks)

Section D (Short Essay Questions)

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

- 23 Explain the important functions of statistics.
- 24 Find the GM of the following frequency distribution :

x	10	20	30	40	50
f	8	7	10	5	10

- 25 Explain different measures of Skewness.
- 26 Define Partition values. Explain different types of partition values.
- 27 Explain combined HM.
- 28 Compute QD from the following data :

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	4	8	11	15	12	6

(4 × 6 = 24 marks)

Section E (Essay Question)

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

29. Define AM. Explain its properties.
30. Explain merits and demerits of SD. Calculate SD and variance of the following data :

Class	0-4	4-8	8-12	12-16	16-20
Frequency	3	8	17	10	2

31. The median and mode of the given data are 33.5 and 34 respectively. Find the values of the unknown Quantities f_3, f_4, f_5 .

Class	F
0-10	4
10-20	16
20-30	F_3
30-40	F_4
40-50	F_5
50-60	6
60-70	4

32. Explain diagrammatic and graphic presentation of data.

(2 × 10 = 20 marks)

Section E (Essay Question)

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

29. Define AM. Explain its properties.
30. Explain merits and demerits of SD. Calculate SD and variance of the following data :

Class	0-4	4-8	8-12	12-16	16-20
Frequency	3	8	17	10	2

31. The median and mode of the given data are 33.5 and 34 respectively. Find the values of the unknown Quantities f_3, f_4, f_5 .

Class	F
0-10	4
10-20	16
20-30	F_3
30-40	F_4
40-50	F_5
50-60	6
60-70	4

32. Explain diagrammatic and graphic presentation of data.

(2 × 10 = 20 marks)

**FIRST SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2020****Statistics****STS 1C 01—BASIC STATISTICS AND PROBABILITY****(Multiple Choice Questions for SDE Candidates)****Time : 15 Minutes****Total No. of Questions : 20****Maximum : 20 Marks****INSTRUCTIONS TO THE CANDIDATE**

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

STS 1C 01—BASIC STATISTICS AND PROBABILITY

(Multiple Choice Questions for SDE Candidates)

1. Which of the following is not an example for a primary data?

- (A) Mailed questionnaire.
 (B) Local correspondents.
 (C) Indirect oral investigation.
 (D) Survey reports in newspapers, journals.

2. Average calculated in which all the items are not equally important is called _____.

- (A) Simple average. (B) Weighted average.
 (C) Combined arithmetic mean. (D) None of these.

3. What is the arithmetic mean of the following data?

Marks	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79
Frequency	5	11	18	22	16	8

- (A) 16.5. (B) 51.6.
 (C) 54.5. (D) 16.6.

4. The measure of central tendency defined as the middle most value of the variable, when the values are arranged in order of magnitude is :

- (A) Median. (B) Mode.
 (C) Arithmetic Mean. (D) Harmonic Mean.

5. What is the median of the following ungrouped data ?

Salary (in Rs.)	150	100	80	200	130
No. of workers	24	70	40	15	10

- (A) 150. (B) 100.
 (C) 80. (D) 130.

6. Find the median wage of the following persons :

Wage (in Rs.)	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of persons	3	5	20	10	5

- (A) 45.75. (B) 50.
 (C) 46.75. (D) 45.

7. Calculate the standard deviation for the following data :
5, 8, 7, 11, 9, 10, 8, 2, 4, 6.
- (A) 2. (B) $\sqrt{5}$.
(C) $\sqrt{6}$. (D) $\sqrt{7}$.
8. Which of the following is not a positional measure ?
- (A) Median. (B) Quartile.
(C) Percentile. (D) None of these.
9. If the minimum value in a set is 12 and its range is 8, what is its maximum value ?
- (A) 4. (B) 20.
(C) 12. (D) 8.
10. ——— Analysis deals with the intensity of relationship among variables :
- (A) Regression. (B) Correlation.
(C) Both (A) and (B). (D) None of these.
11. Predict the value of y when $x = 10$ using regression line of y on x of the following data :
- $$\sum x = 140, \sum y = 70, \sum x^2 = 2038, \sum y^2 = 1103, \sum xy = 1035, n = 10$$
- (A) 4.18. (B) 5.71.
(C) 7.05. (D) 2.87.
12. Which of the following is not a characteristic of a random experiment ?
- (A) Number of outcomes is 2 or more.
(B) All outcomes are not known in advance.
(C) Outcome obtained in a particular trial is not known in advance.
(D) Experiment can be repeated under identical conditions.
13. Which of the given sets are not an event of the sample space $S = \{a, 1, 2, 3, z\}$.
- (A) $\{a, z\}$. (B) $\{1, 2, 3\}$.
(C) $\{\}$. (D) $\{a, b\}$.
14. Which among the following is a sample space obtained while tossing a coin thrice ?
- (A) $\{(H, T), (T, H), (T, T), (H, H)\}$.
(B) $\{(H, H, H), (H, T, T), (T, T, T)\}$.
(C) $\{(H, H), (T, T)\}$.
(D) $\{(H, H, H), (H, H, T), (H, T, T), (T, H, T), (H, T, H), (T, T, H), (T, H, H), (T, T, T)\}$.

15. Classical definition of probability gives that if the elementary events of a random experiment are mutually exclusive, exhaustive and equally likely, then :
- (A) $P(A) = \text{Number of outcomes of } A / \text{Total number of outcomes.}$
 (B) $P(A) = \text{Number of elements in } A.$
 (C) $P(A) = \text{Number of elements in } S / \text{Number of outcomes of } A.$
 (D) None of the above.
16. Classical definition of probability is applicable only when the following holds true :
- (i) Sample space is finite.
 (ii) Events are mutually exclusive.
 (iii) Events are equally likely.
 (iv) Events are exhaustive.
- (A) (i), (ii). (B) (ii), (iii), (iv).
 (C) (i), (ii), (iii), (iv). (D) (i).
17. Which of the following is not an axiom in the axiomatic definition of probability ?
- (A) $P(A) \geq 0$, A be any event.
 (B) $P(S) = 1.$
 (C) A_1, A_2, \dots be disjoint events, then $P(A_1 \cup A_2 \cup \dots) = P(A_1) + P(A_2) + \dots$
 (D) None of these.
18. Suppose sample space S has 4 elements $S = \{a_1, a_2, a_3, a_4\}$, which of these functions defines a probability in S ?
- (A) $P(a_1) = 1/2, P(a_2) = 1/3, P(a_3) = 1/4, P(a_4) = 1/5.$
 (B) $P(a_1) = 1/2, P(a_2) = 1/4, P(a_3) = -1/4, P(a_4) = 1/2.$
 (C) $P(a_1) = 1/2, P(a_2) = 1/4, P(a_3) = 1/4, P(a_4) = 0.$
 (D) None of these.
19. If $P(A) = 0.3, P(B) = 0.2, P(A \cap B) = 0.1$, what is the probability that exactly one of the events occurs ?
- (A) 0.3. (B) 0.4.
 (C) 0.6. (D) 1.
20. In a rowing race, the odds that A will win is 2 to 3 and the odds that B will win is 1 to 4. What is the probability that A or B wins the race ?
- (A) $3/5.$ (B) $1/5.$
 (C) $2/5.$ (D) $4/5.$

**FIRST SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2020**

Statistics

STS 1C 01—BASIC STATISTICS AND PROBABILITY

Time : Three Hours

Maximum : 80 Marks

Section A

Answer all questions in one word.

Each question carries 1 mark.

Fill up the blanks :

1. Most frequent observation in a set of observations is called the _____.
2. 10th percentile is the observation which comes in the _____ position after arranging the total of N observations in ascending order of magnitude.
3. When two regression lines for x and y coincides, the coefficient of correlation between x and y is _____.
4. If, $A \subset B$, $P(A^c \cap B) =$ _____.
5. For any two independent events A and B, $P(A^c/B) =$ _____.

Write True or False :

6. For a set of observations HM is always lies in between AM and GM.
7. Quartile deviation can be found using 25th percentile and 3rd quartile.
8. If A is independent of B and B is independent of C, then A is independent of C.
9. $p(x) = \frac{x-2}{5}$, $x = 1, 2, 3, 4, 5$ and $p(x) = 0$, otherwise is a probability mass function of X.
10. For a continuous random variable X, $P(X \leq 5) = P(X < 5)$.

(10 × 1 = 10 marks)

Turn over

Section B

Answer **all** questions in **one sentence** each.

Each question carries 2 marks.

11. Define Median.
12. Define Deciles.
13. If $r_{12} = 0.93$, $r_{13} = 0.99$ and $r_{23} = 0.92$, calculate $r_{12.3}$.
14. Use frequency definition of probability to prove $0 \leq P(A) \leq 1$ for an event A.
15. 4 coins are tossed. Find the probability that at least one head turns up.
16. Write the multiplication theorem on probability for two events A and B.
17. Prove that addition of a constant to every observations of a set making no change in the standard deviation of the set.

(7 × 2 = 14 marks)

Section C

Answer any **three** questions.

Each question carries 4 marks.

18. Explain the method of finding correlation between two characteristics which are qualitative in nature.
19. Given the regression lines $9x - 4y + 15 = 0$ and $25x - 6y - 7 = 0$. Find the co-efficient of correlation between X and Y.
20. For the events A and B, prove that $P(A \cup B/C) = P(A/C) + P(B/C) - P(A \cap B/C)$.
21. Obtain the probability distribution of X from the distribution function of X,

$$F(x) = \begin{cases} 0, & \text{for } x < 0 \\ \frac{1}{3}, & \text{for } 0 \leq x < 1 \\ 1, & \text{for } x \geq 1. \end{cases}$$

22. Find k , if $p(x) = \frac{2x}{k}$, $x = 1, 2, 3, 4$ is a probability mass function.

(3 × 4 = 12 marks)

Section D

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

23. Calculate the mean deviation about mean for the following data :

x	20	18	16	14	12	10	8	6
Frequency	2	4	9	18	27	25	14	1

24. Using principle of least squares, explain the fitting of the curve of the form $y = ax^b$.

25. Prove that $-1 \leq r_{xy} \leq 1$, where r_{xy} is Pearson's co-efficient of correlation between X and Y.

26. For a random variable X with p.m.f. $p(x) = \left(\frac{1}{3}\right)\left(\frac{2}{3}\right)^x$ for $x = 0, 1, 2, \dots$, Prove that,
 $P(X \geq 7/X \geq 4) = P(X \geq 3)$.

27. Let X is a random variable with p.d.f.

$$f(x) = \begin{cases} kx^{-5x}, & \text{when } 0 < x < \infty \\ 0, & \text{elsewhere} \end{cases}$$

Find (i) K ; and (ii) Prove that $P(X \geq 6/X \geq 2) = P(X \geq 4)$.

28. Given $f(x) = \begin{cases} \lambda e^{-\lambda x}, \\ 0, \text{ otherwise} \end{cases}$ as the p.d.f. of X. Obtain the p.d.f. of $Y = 2X - 3$.

(4 × 6 = 24 marks)

Section E

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

29. (i) Define dispersion.

(ii) Obtain the coefficient of variation and co-efficient of quartile deviation for the following data :

Class	0 - 2	2 - 4	4 - 6	6 - 8	8 - 10	10 - 12
Frequency	5	16	13	7	5	4

Turn over

30. Derive equations of regression lines passing through the points $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$. Also prove that (\bar{x}, \bar{y}) is their point of intersection.
31. (i) State Bayes' theorem.
- (ii) A balanced die is thrown once. If a 2 appears, a ball is drawn from first box; otherwise, a ball is drawn from second box. First box contains four red, three white, and three black balls. Second box contains six red, two white and two black balls. Find the probability that first box was used given that a red ball was drawn.
32. Given the probability density function of X as :

$$f(x) = \begin{cases} ax, & \text{for } 0 \leq x \leq 1 \\ a, & \text{for } 1 \leq x \leq 2 \\ -ax + 3a, & \text{for } 2 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}$$

- (i) Find a .
- (ii) Obtain the distribution function of X.
- (iii) Using the distribution function find : (a) $P(X < 1.5)$ and ; (b) $P(X > 2 / X < 5)$.

(2 × 10 = 20 marks)

**FIRST SEMESTER B.A./B.Sc. DEGREE EXAMINATION
NOVEMBER 2020**

(CUCBCSS)

Statistics

STS 1B 01—BASIC STATISTICS AND PROBABILITY

Time : Three Hours

Maximum : 80 Marks

Use of Calculator is permitted.

Section A (One Word Questions)

Answer all questions.

Each question carries 1 mark.

1. Sum of deviations of the observations taken from their AM is _____.
2. Let standard deviation of x_1, x_2, \dots, x_n is k . Then the standard deviation of the set $x_1 - a, x_2 - a, \dots, x_n - a$, where a is a constant is _____.
3. Co-efficient of quartile deviation is _____.
4. Two events which cannot occur together are called _____ events.
5. For a random variable X with distribution function F , $F_X(+\infty) =$ _____.
6. A random variable which can take uncountable values within certain limit is _____.
7. $P(A) = 0.3, P(B) = 0.4$, then $P(A \cup B)$ when A and B are independent is _____.
8. Geometric mean of regression co-efficients gives the absolute value of _____.
9. The minimum possible value of Pearson's co-efficient of correlation between two variables X and Y is _____.
10. The partial correlation between X_1 and X_2 , $r_{12.3} = \frac{\dots}{\sqrt{(1 - r_{13}^2)(1 - r_{23}^2)}}$.

(10 × 1 = 10 marks)

Turn over

Section B (One Sentence Questions)

Answer all questions.

Each question carries 2 marks.

11. Define Geometric mean.
12. Define Quartile Deviation.
13. Define exhaustive events.
14. Define a random experiment.
15. Define discrete random variable.
16. State the multiplication theorem on probability for two events A and B.
17. Define the multiple correlation $R_{1.23}$ for the random variables X_1 , X_2 and X_3 .

(7 × 2 = 14 marks)

Section C (Paragraph Questions)

Answer any three questions.

Each question carries 4 marks.

18. Prove that the sum of squares of the deviations of a set of observations is minimum when it is taken about their A.M.
19. Let x values are changed to u values as $u_i = \frac{x_i - A}{c}$, then prove that $SD(x) = SD(u)$.
20. For an event A, using frequency definition prove that :
 - (i) $P(S) = 1$; and (ii) $P(A^c) = 1 - P(A)$.
21. Define probability density function and state its properties.
22. Explain the method of curve fitting using the principle of least squares.

(3 × 4 = 12 marks)

Section D (Short Essay Questions)

Answer any four questions.

Each question carries 6 marks.

23. Define partition values. Describe important partition values and their inter-relations.

24. Calculate the coefficient of variation for the following data :

Class	10–20	20–30	30–40	40–50	50–60	60–70
Frequency	10	18	32	40	22	18

25. State and prove addition theorem on probability for three events A, B and C.

26. A box contains 6 Red, 4 White and 5 Black balls. Four balls are drawn at random. What is the probability that among the balls drawn there is at least one ball of each colour ?

27. Let X is a random variable with p.d.f., $f(x) = \begin{cases} 4x^3, & \text{when } 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$. Find (i) $F(x)$ and use this to find ; (ii) $P(0.2 \leq X \leq 0.4)$; and (iii) $P(X > 0.8)$.

28. Given $f(x) = \begin{cases} 1, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$ as the p.d.f. of X. Obtain the p.d.f. of $Y = -2 \log_e X$.

(4 × 6 = 24 marks)

Section E (Essay Questions)

Answer any **two** questions.

Each question carries 10 marks.

29. A variable takes values $a, ar, ar^2, \dots, ar^{n-1}$ each with frequency unity. If A, G and H are

respectively the A.M., G.M., and H.M., show that $A = \frac{a(1-r^n)}{n(1-r)}$, $G = ar^{\frac{n-1}{2}}$ and $H = \frac{an(1-r)^{n-1}}{1-r^n}$.

Hence show that $AH = G^2$.

30. An insurance company insured 3000 scooter drivers, 2000 car drivers and 5000 truck drivers. The probability of accident by the drivers of these types of vehicles is 0.04, 0.02 and 0.03 respectively. One of the insured people meets an accident. What is the probability that he is a truck driver?

31. In a box of 12 toys, 3 are damaged. From this bag a sample of 4 toys are drawn without replacement. Let X denotes the number of damaged toys in the sample. Find the probability distribution and the distribution function of X.

32. Explain Rank correlation co-efficient. Derive Spearman's rank correlation co-efficient.

(2 × 10 = 20 marks)

**FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2020**

Statistics

STA 1C 01—INTRODUCTORY STATISTICS

(2019 Admissions)

Time : Two Hours

Maximum : 60 Marks

Use of Calculator and Statistical table are permitted.

Section A (Short Answer Type Questions)

Answer at least eight questions.

Each question carries 3 marks.

All questions can be attended.

Overall Ceiling 24.

1. Expand NSSO. Write any *two* of its responsibilities.
2. Define primary and secondary data.
3. Define population and sample.
4. For a set of observations, show that sum of deviation of the observations from their arithmetic mean is zero.
5. Define quartiles and quartile deviation.
6. Define outliers in a box plot.
7. What is the variance of a set of values with mean and co-efficient of variation are respectively 20 and 60 % ?
8. Define Scatter diagram.
9. Calculate the coefficient of correlation between x and y , where the regression coefficients are $-\frac{16}{3}$ and $-\frac{1}{12}$.
10. Define time series and write any *two* of its objectives.
11. Define secular trend in a time series.
12. Differentiate price and quantity index numbers.

(8 × 3 = 24 marks)

Turn over

Section B (Short Essay/Paragraph Type Questions)

Answer at least five questions.

Each question carries 5 marks.

All questions can be attended.

Overall Ceiling 25.

13. Write a brief note on the statistical system in states.
14. Point out any *five* main differences between questionnaire and schedule.
15. First four raw moments of a set of data are $-2, 8, 24$ and 260 . Calculate the first four central moments.
16. State principle of least square and fit a straight line of the form $y = ax + b$ to the following data on x and y :
- | | | | | | |
|-----|----|----|----|----|----|
| x | 4 | 6 | 8 | 10 | 12 |
| y | 12 | 15 | 22 | 34 | 40 |
17. Derive an expression for the angle between two regression lines.
18. For two variables x and y , show that $-1 \leq r_{xy} \leq 1$, where r_{xy} is Pearson's co-efficient of correlation.
19. What are seasonal indices ? Calculate the seasonal indices for the quarters from the following data on the values of an item by the method of simple averages :

Year	1 st quarter	2 nd quarter	3 rd quarter	4 th quarter
2011	24	26	38	30
2012	22	28	42	28
2013	26	30	40	32
2014	24	26	38	34
2015	28	30	42	30

(5 × 5 = 25 marks)

Section C (Essay Type Questions)

Answer any one question.

The question carries 11 marks.

20. Find the median marks of 100 students from the following data. Also locate median graphically by drawing ogives :

Marks	:	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Students	:	3	14	22	34	16	7	4

21. (i) Explain the problems while constructing index numbers.
(ii) Explain any *two* weighted price index numbers.
(iii) Show that Fisher's index number satisfies time reversal test.

(1 × 11 = 11 marks)