# STATISTICS SEMESTER WISE PREVIOUS YEARS QUESTION PAPERS

| S.NO | SEM | PAPER | TITLE | YEAR | CODE |
|---|---|---|---|---|---|
| | | | **PAPER-I** | | |
| 1 | I | I | DESCRIPTIVE STATISTICS & PROBABILITY | Aug/22 | D-7506 |
| 2 | I | I | DESCRIPTIVE STATISTICS & PROBABILITY | Aug/22 | D-6006/BL |
| 3 | I | I | DESCRIPTIVE STATISTICS & PROBABILITY | Mar/22 | 6006 |
| 4 | I | I | DESCRIPTIVE STATISTICS & PROBABILITY | NOV/DEC-2021 | 19008/N/BL |
| 5 | I | I | DESCRIPTIVE STATISTICS & PROBABILITY | Aug/21 | 19008 |
| 6 | I | I | DESCRIPTIVE STATISTICS & PROBABILITY | NOV/DEC-2018 | 3007 |
| 7 | I | I | DESCRIPTIVE STATISTICS & PROBABILITY | Dec/17 | 7007 |
| 8 | I | I | DESCRIPTIVE STATISTICS & PROBABILITY | MAY/JUNE-2017 | 229/BL |
| 9 | I | I | DESCRIPTIVE STATISTICS & PROBABILITY | Dec/16 | 229 |
| | | | **PAPER-II** | | |
| 1 | II | II | PROBABILITY DISTRIBUTIONS | JUNE/JULY-2022 | D-6206 |
| 2 | II | II | PROBABILITY DISTRIBUTIONS | JUNE/JULY-2022 | D-7556/BL |
| 3 | II | II | PROBABILITY DISTRIBUTIONS | SEP/OCT-2021 | 18037/O |
| 4 | II | II | PROBABILITY DISTRIBUTIONS | MAY/JUNE-2019 | 3037 |
| 5 | II | II | PROBABILITY DISTRIBUTIONS | MAY/JUNE-2018 | 7036 |
| 6 | II | II | PROBABILITY DISTRIBUTIONS | MAY/JUNE-2017 | 267 |
| | | | **PAPER-III** | | |
| 1 | III | III | STATISTICAL METHODS | Aug/22 | D-7606 |
| 2 | III | III | STATISTICAL METHODS & THEORY OF ESTIMATION | Aug/22 | D-6318/BL |
| 3 | III | III | STATISTICAL METHODS & THEORY OF ESTIMATION | Mar/22 | 6318 |
| 4 | III | III | STATISTICAL METHODS & THEORY OF ESTIMATION | NOV/DEC-2021 | 18075/N/BL |
| 5 | III | III | STATISTICAL METHODS | NOV/DEC-2021 | 18075/O/BL |
| 6 | III | III | STATISTICAL METHODS & THEORY OF ESTIMATION | Jul/21 | 18075 |
| 7 | III | III | STATISTICAL METHODS | OCT/NOV-2020 | 8075 |
| 8 | III | III | STATISTICAL METHODS | NOV/DEC-2019 | 8075 |
| 9 | III | III | STATISTICAL METHODS | NOV/DEC-2018 | 3074 |
| 10 | III | III | STATISTICAL METHODS | MAY/JUNE-2018 | 7070/BL |
| 11 | III | III | STATISTICAL METHODS | Dec/17 | 7070 |
| | | | **PAPER-IV** | | |
| 1 | IV | IV | STATISTICAL INFERENCE | JUNE/JULY-2022 | D-6418 |
| 2 | IV | IV | INFERENCE | JUNE/JULY-2022 | D-7656/BL |
| 3 | IV | IV | INFERENCE | JAN/FEB-2021 | 9776 |
| 4 | IV | IV | STATISTICAL INFERENCE | SEPT/OCT-2021 | 18125/N |
| 5 | IV | IV | INFERENCE | MAY/JUNE-2018 | 7116 |
| | | | **PAPER-V** | | |
| 1 | V | V-A | APPLIED STATISTICS-I | Mar/22 | 6518 |
| 2 | V | V-A | APPLIED STATISTICS-I | JUNE/JULY-2022 | D-6518/BL |

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|---|---|---|---|---|---|
| 3 | V | V | SAMPLING THEORY ,TIME SERIES,INDEX NUMBERS & DEMAND ANALYSIS | JUNE/JULY-2022 | D-7717 |
| 4 | V | V | SAMPLING THEORY ,TIME SERIES,INDEX NUMBERS & DEMAND ANALYSIS | NOV/DEC-2021 | 18192/BL |
| 5 | V | V | SAMPLING THEORY ,TIME SERIES,INDEX NUMBERS & DEMAND ANALYSIS | Jul/21 | 18192 |
| 6 | V | V | SAMPLING THEORY ,TIME SERIES,INDEX NUMBERS & DEMAND ANALYSIS | OCT/NOV-2020 | 8192 |
| 7 | V | V | SAMPLING THEORY ,TIME SERIES,INDEX NUMBERS & DEMAND ANALYSIS | NOV/DEC-2019 | 8192 |
| 8 | V | V | SAMPLING THEORY ,TIME SERIES,INDEX NUMBERS & DEMAND ANALYSIS | NOV/DEC-2018 | 3190 |
| | | | **PAPER-VI** | | |
| 1 | V | VI-A | STATISTICAL QUALITY CONTROL AND RELIABILITY | NOV/DEC-2021 | 18193/BL |
| 2 | V | VI-A | STATISTICAL QUALITY CONTROL AND RELIABILITY | Jul/21 | 18193 |
| 3 | V | VI-A | STATISTICAL QUALITY CONTROL AND RELIABILITY | Nov/20 | 8193 |
| 4 | V | VI-A | STATISTICAL QUALITY CONTROL AND RELIABILITY | NOV/DEC-2018 | 3191 |
| | | | **PAPER-VII** | | |
| 1 | VI | VII-A | APPLIED STATISTICS-II | JUNE/JULY-2022 | D-6620 |
| 2 | VI | VII | DESIGN OF EXPERIMENTS,VITAL STATISTICS,OFFICIAL STATISTICS AND BUSINESS FORECASTING | Jul/21 | 18314 |
| 3 | VI | VII | DESIGN OF EXPERIMENTS,VITAL STATISTICS,OFFICIAL STATISTICS AND BUSINESS FORECASTING | SEPT/OCT-2020 | 8314 |
| 4 | VI | VII | DESIGN OF EXPERIMENTS,VITAL STATISTICS,OFFICIAL STATISTICS AND BUSINESS FORECASTING | SEPT/OCT-2019 | 3321/BL |
| | | | **PAPER-VIII** | | |
| 1 | VI | OPTION | OPERATION RESEARCH | JUNE-AUG 2022 | D-6622 |
| 2 | VI | VIII-A | OPERATION RESEARCH | JUNE/JULY-2022 | D-7818 |
| 3 | VI | VIII-A | OPERATION RESEARCH | NOV/DEC-2021 | 18315/BL |
| 4 | VI | VIII-A | OPERATION RESEARCH | JULY/AUG-2021 | 18315 |
| 5 | VI | VIII-A | OPERATION RESEARCH | SEPT/OCT-2020 | 8315 |
| **STATISTICS YEAR WISE PREVIOUS YEARS QUESTION PAPERS** | | | | | |
| | | | **PAPER-I** | | |
| 1 | I-YR | I | DESCRIPTIVE STATISTICS & PROBABILITY DISTRIBUTIONS | December/20 | 9522 |
| 2 | I-YR | I | DESCRIPTIVE STATISTICS & PROBABILITY DISTRIBUTIONS | MAR/APR-2019 | 4022/BL |

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|---|---|---|---|---|---|
| 3 | I-YR | I | DESCRIPTIVE STATISTICS & PROBABILITY DISTRIBUTIONS | OCT/NOV-2018 | 7525/BL/S |
| 4 | I-YR | I | DESCRIPTIVE STATISTICS & PROBABILITY DISTRIBUTIONS | OCT/NOV-2016 | 2025/S |
| 5 | I-YR | I | DESCRIPTIVE STATISTICS & PROBABILITY DISTRIBUTIONS | PRE-FINAL MAR-2015 | |
| 6 | I-YR | I | DESCRIPTIVE STATISTICS & PROBABILITY DISTRIBUTIONS | MAR/APR-2014 | 1525/E |
| 7 | I-YR | I | DESCRIPTIVE STATISTICS & PROBABILITY DISTRIBUTIONS | OCT/NOV-2013 | 5555/ET/S |
| 8 | I-YR | I | DESCRIPTIVE STATISTICS & PROBABILITY DISTRIBUTIONS | OCT/NOV-2012 | 8057/ET/S |
| 9 | I-YR | I | DESCRIPTIVE STATISTICS & PROBABILITY DISTRIBUTIONS | PRE-FINAL | |
| | | | **PAPER-II** | | |
| 1 | II-YR | II | STATISTICAL METHODS AND INFERENCE | MAR/APRIL-201 | 4023/BL |
| 2 | II-YR | II | STATISTICAL METHODS AND INFERENCE | OCT/NOV-2018 | 7526/BL/S |
| 3 | II-YR | II | STATISTICAL METHODS AND INFERENCE | MAR/APRIL-201 | 7526/BL |
| 4 | II-YR | II | STATISTICAL METHODS AND INFERENCE | OCT/NOV-2016 | 2026/S |
| 5 | II-YR | II | STATISTICAL METHODS AND INFERENCE | OCT/NOV-2013 | 5556/ET/S |
| 6 | II-YR | II | STATISTICAL METHODS AND INFERENCE | OCT/NOV-2012 | 8058/ET/S |
| 7 | II-YR | II | STATISTICAL METHODS AND INFERENCE | MAR/APRIL-201 | 1579/ET |
| | | | **PAPER-III** | | |
| 1 | III-YR | III | APPLIED STATISTICS | MAR/APRIL-201 | 4024/BL |
| | | | **PAPER-IV** | | |
| 1 | III-YR | IV | QUALITY CONTROL,RELIABILITY AND OPERATIONS RESEARCH | OCT/NOV-2021 | 18625 |
| 2 | III-YR | IV | QUALITY CONTROL,RELIABILITY AND OPERATIONS RESEARCH | MAR/APRIL-201 | 4025/BL |
| 3 | III-YR | IV | QUALITY CONTROL,RELIABILITY AND OPERATIONS RESEARCH | OCT/NOV-2018 | 7528/BL/S |

# PAPER-I

# FACULTY OF SCIENCES

## B.A. / B.Sc. (CBCS) I- Semester (Backlog) Examination, August 2022

### Subject: Statistics

### Paper – I : Descriptive Statistics and Probability

**Time: 3 Hours** **Max. Marks: 80**

### PART – A

**Note: Answer any five questions.** **(5 x 4 = 20 Marks)**

1. Write a short note on designing of questionnaire.
2. What is skewness? What are its measures? Explain.
3. Give mathematical definition of Probability. What are its limitations?
4. If A and B are two events on the space 'S', Show that $P(A \cap B)=P(A) . P(B/A)$, $P(A)>0$.
5. Show that if two random variables are said to be stochastically independent if their joint density f(x,y) can be expressed as product of their marginal densities f(x) and f(y).
6. Let the joint density function of a two-dimensional random variables be

   $f(x,y)=8xy$ ; $0<x<y<1$

   $= 0$ ; otherwise

   Find the marginal densities of X and Y.
7. Define covariance of a bi-variate random variable. How it is obtained through expectations?
8. State and prove multiplication theorem of expectations for two variables.

### PART – B

**Note: Answer all the questions.** **(4 x 15 = 60 Marks)**

9. (a) Explain in detail classification and tabulation of data.

   **(OR)**

   (b) Explain about relative measures of dispersion with examples.

10. (a) State and prove Boole's inequality.

    **(OR)**

    (b) Foe 'n' events $A_1, A_2, \text{--------}, A_n$ defined on a sample space 'S', Show that

$$P\left(\bigcup_{i=1}^{n} A_i\right) \geq \sum_{i=1}^{n} P(A_i) - \sum_{1 \leq i \leq j \leq n} P(A_i \cap A_j).$$

11.(a) Explain the procedure of One dimensional random variable. Let the probability density function of x be $f(x) = 2x;\ 0<x<1$

$= 0$ ; otherwise

Fined the probability density function of 3x+1.

**(OR)**

(b) A continuous random variable X in the range (-3, 3) is has the following distribution.

$$f(x) = \begin{cases} \frac{1}{16}(3 = x)^2 ; -3 \le x \le -1 \\ \frac{1}{16}(6 - 2x^2); -1 \le x \le 1 \\ \frac{1}{16}(3 - x)^2 \ ; 1 \le x \le 3 \\ = 0 \qquad ; otherwise \end{cases}$$

(i) Verify whether it is a probability density function or not.
(ii) Find the mean and variance of x.

12.(a) Define mathematical expectations. Give an example where expectation doesn't exist, State and prove addition theorem of mathematical expectations.

**(OR)**

(b) Define moment and cumulate generating functions and characteristic functions. Examine the effect of shift of origin and on the above three functions.

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Code No. D-6006/BL

# FACULTY OF SCIENCE

## B.Sc. / B.A. (CBCS) I Semester (Backlog) Examination, August 2022

**Subject: Statistics**

**Paper-I: Descriptive Statistics and Probability**

Time: 3 Hours | Max. Marks: 80

### PART – A

**Note: Answer any eight questions.** (8 x 4 = 32 Marks)

1. Explain the properties of Arithmetic mean.
2. Define measures of Dispersion. Explain how standard deviation is the best measure of dispersion.
3. Define central and non-central moments. Explain Sheppard's correction for moments
4. Define probability of an event. Prove that P ($\bar{A}$) = 1- P (A)
5. State and prove Bayes' theorem.
6. Explain pairwise independent and mutually independent events with examples.
7. Explain pmf and pdf of random variables.
8. A continuous random variable X follows the probability law:

   $f(x) = Ax^2$ ; $0 \leq x \leq 1$,

   $= 0$ ; otherwise. Find A.
9. Define Distribution function. State its properties
10. Define Covariance between two random variables
11. State and prove addition theorem of expectations of random variables
12. State and prove Cauchy Schwartz's inequality.

### PART – B

**Note: Answer all the questions.** (4 x 12 = 48 Marks)

13. (a) Explain Karl Pearson's and Bowley's measures Skewness.

**(OR)**

(b) Define moment. Derive the relations between central moments in terms of non-central moments.

14. (a) State and Prove Addition theorem of probability for n events.

**(OR)**

(b) State and Prove Multiplication theorem of probability for **two** events. Prove that for any two events A and B, P ($\bar{A} \cap$ B) = P(B) - P( A ∩ B )

15. (a) Define Random variable. A random variable X has the following pmf

| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| P(X) | 0 | k | 2k | 2k | 3k | $k^2$ | $2k^2$ | $7k^2+k$ |

(i) Find k (ii) P $(X \leq 5)$ P $(0<x<3)$ (iii) P $(X \geq 5)$ (iv) F(x)

**(OR)**

(b) Explain Bivariate distribution

Let X and Y be two random variables with the joint probability density function $f(x, y) = \frac{1}{16}(x^3 y^3)$ ; $0< x \leq 2$ , $0< y \leq 2$ = 0 otherwise.

Examine whether X and Y are independent.

16. (a) Define Moment generating function of a random variable. Derive moments from it. Explain the properties of MGF.

**(OR)**

(b) State and prove Chebyshev's inequality.

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11-03-2022 [illegible]

Code No. 6006



# FACULTY OF SCIENCE

B.Sc. / BA (CBCS) I – Semester Examination, March 2022

Subject: Statistics

Paper-I: Descriptive Statistics and Probability

Time: 3 Hours Max. Marks: 80

## PART – A

Note: Answer any eight questions. (8 x 4 = 32 Marks)

1. Define primary data. Mention methods of collecting it.
2. Distinguish between questionnaire and schedule?
3. The weights of 6 competitors in a game are given as 58, 62, 56, 63, 55, 61kgs. Find the A.M of weights of the competitors.
4. A problem in statistics is given to 2 students A and B .The probability that A solves the problem is ½ and that of B to solve the problem is 2/3.Find the probability that problem is solved.
5. Write short notes on conditional probability.
6. Explain Mathematical definition of probability.
7. A random variable X has the following probability function i) Find K ii) P(0<x<5)

| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| P(x) | k | 2k | 2k | 3k | $k^2$ | $2k^2$ | $7k^2+k$ |

8. Define the term random variable with an example.
9. Explain marginal distribution function.
10. What is mathematical expectation?
11. State and prove addition theorem of expectation for two events.
12. Find the expected value of the random variable X whose density function is

$$f(x) = \frac{1}{2}; 1 < x < 2$$
$$= 0; \ Otherwise$$

## PART – B

Note: Answer any four questions. (4 x 12 = 48 Marks)

13. State and prove any two properties of mean.
14. Define central and non -central moments. Derive central moments in terms of non-central moments.
15. State and prove multiplication theorem for n events.
16. State and prove Baye's theorem

17. Define the following terms

i) Probability mass function ii) Probability density function

iii) Conditional probability function

18. The diameter of an electric cable say X is assumed to be a continuous random variable with pdf $f(x)=6x(1-x); 0 \leq x \leq 1$

$=0$ ; otherwise

(i) Check whether f(x) is a p.d.f or not

(ii) Determine a number b such that $P(x<b)=P(x>b)$.

(iii) Find mean

19. State and Prove Chebychev 's inequality

20. Define cumulant generating function. What is the effect of change of origin and scale on cumulant generating function.

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Code No. 19008/N/BL

# FACULTY OF SCIENCE

## B.A. / B.Sc. I-Semester (CBCS) Examination, November / December 2021

### Subject: Statistics

### Paper – I : Descriptive Statistics and Probability

Time: 2 Hours Max. Marks: 80

## PART – A

**Note: Answer any five questions.** (5 x 4 = 20 Marks)

1 What is meant by classification? State its objectives.
2 What is secondary data? What are the sources of secondary data?
3 What is meant by skewness? Define various types of skewness.
4 Define Statistical definition of probability and discuss its merits and demerits.
5 State and prove addition theorem of probability for two events.
6 State and prove Baye's theorem.
7 Explain transformation of one dimensional random variable.
8 Define distribution function. State its properties.
9 Define random variable and types of random variables. Give one example for each.
10 Define moment generating function. State its properties.
11 Define mathematical expectation of a random variable. Define raw and central moments using mathematical expectation.
12 State and prove multiplication theorem of expectation for two independent random variables.

## PART – B

**Note: Answer any three questions.** (3 x 20 = 60 Marks)

13 Define central and non central moments. Establish the relationship between them.

14 Explain various measures of dispersion. What are their merits and demerits?

15 Define conditional probability. State and prove multiplication theorem of probability for 'n' events.

16 State and prove Boole's inequality.

17 A continuous random variable X has the p.d.f. $f(x) = a(x - x^2)$, $0 \leq x \leq 1$ then

(i) Determine 'a' (ii) Find mean and variance (iii) Find distribution function

18 The joint probability density function of a two-dimensional random variable (X, Y) is given by

$$f(x,y)=\begin{cases} 2;0<x<1, & 0<y<x \\ 0; & otherwise \end{cases}$$

(i) Find the marginal density functions of X and Y
(ii) Find the conditional density function Y given X = x and conditional density function of X given Y = y.
(iii) Check the independence of X and Y

19 State and prove Chebyshev's inequality and discuss its importance.

20 Define cumulant generating function. State and prove its properties.

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9/08/21 A.N.

Code No. 19008

# FACULTY OF SCIENCE

## B.A./B.Sc. I Semester (CBCS) Examination, August 2021

**Subject: Statistics (Theory)**
**Paper - I: Descriptive Statistics and Probability**

Time: 2 Hours | Max. Marks: 80

### PART – A

**Note: Answer any five questions.** (5 x 4 = 20 Marks)

1 Derive limits for Bowley's coefficient of skewness.
2 Explain Sheppard's correction for moments.
3 Define Kurtosis and explain its measure.
4 If A and B are independent events then show that $\overline{A}$ and $\overline{B}$ are also independent.
5 Define conditional probability and independent events.
6 Define axiomatic definition of Probability.
7 Define distribution function. State its properties.
8 Define joint and marginal probability mass functions.
9 If a random variable 'X' is exponentially distributed with the parameter 1. Find the p.d.f of $Y = \sqrt{X}$.
10 State and prove multiplication theorem of mathematical expectation of two random variables.
11 Define cumulant generating function. State its properties.
12 State and prove Cauchy-Schwartz inequality.

### PART – B

**Note: Answer any three questions.** (3 x 20 = 60 Marks)

13 What is primary data? Explain various methods for collecting primary data.

14 Explain various measures of central tendencies. State their merits and demerits.

15 State and prove addition theorem of probability for 'n' events.

16 (i) State and prove Baye's theorem.
(ii) In a bolt factory machines X,Y,Z manufactures respectively 25%, 35% and 40% of the total bolts of their output 5%, 4% and 2% are defective bolts. A bolt is drawn at random and is found to be defective. What is the probability that it was manufactured by machine 'X'?

17 Define a random variable. Let X be a continuous random variable with probability density function

$$f(x) = \begin{cases} ax; & 0 < x < 1 \\ a; & 1 < x < 2 \\ -ax + 3a; & 2 < x < 3 \\ 0; & \text{otherwise} \end{cases}$$

(i) Determine the constant 'a'.
(ii) Determine distribution function.

18 The joint p.d.f of X and Y is given by

$$f(x,y)=\begin{cases}8xy; & 0<x<y<1\\ 0; & otherwise\end{cases}$$

Find (i) Marginal probability density functions of X and Y.
(ii) Conditional density functions of X given Y and Y given X.

19 Define moment generating function. State and prove any four its properties.

20 Define mathematical expectation of a random variable. State and prove addition theorem of expectation of two random variables.

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Code No. 3007

# FACULTY OF SCIENCE

## B.Sc. I-Semester (CBCS) Examination, November / December 2018

**Subject : Statistics**

**Paper – I : Descriptive Statistics and Probability**

Time : 3 Hours

Max. Marks: 80

**PART – A (5 x 4 = 20 Marks)**
**(Short Answer Type)**
**Note : Answer any FIVE of the following questions.**

1 Define Arithmetic mean, Geometric mean and Harmonic mean.
2 Define Central and Non-central moments. State their interrelationship.
3 Define (i) Independence of events (ii) airwise and independence and (iii) mutual independence of events.
4 Prove that for any three events A, B and C
$P(A \cup B / C) = P(A/C) + P(B/C) - P(A \cap B/C)$
5 Define distribution function and state its properties.
6 The random variable X has an exponential distribution, $f(x) = e^{-x}, 0 \leq x < \infty$. Find the density function of the random variable Y = 3X + 5
7 Define Mathematical expectation of a random variable. Find the expectation of the number on a die when thrown.
8 What is the effect of change of origin and scale on moment generating function?

**PART – B (4 x 15 = 60 Marks)**
**(Essay Answer Type)**
**Note: Answer ALL questions.**

9 (a) Define Primary data. What are the different methods of collecting and editing of primary data? Describe any one method in detail with example.

**OR**

(b) (i) Explain the concept of skewness. Obtain the limits for Karl Pearson's coefficient of skewness.
(ii) The first four moments of a distribution about the value 4 are 1, 4, 10 and 45 respectively. ? Compute coefficient of skewness, Kurtosis and comment upon the results.

10 (a) (i) Define Axiomatic approach to probability.
(ii) Prove that for any two events A and B
$P(A \cap \overline{B}) = P(A) - P(A \cap B)$.
(iii) The chances of solving a problem of three persons X, Y and Z are $\frac{1}{3}, \frac{1}{2}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved?

**OR**

(b) State and prove multiplication theorem of Probability for 'n' events.

11 (a) (i) Define discrete and continuous Random variables.
(ii) A continuous random variable X has the following p.d.f.

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

Determine the constant 'a', compute $P(x\le 1.5)$ and $P(x>2.5)$

**OR**

(b) The joint p.d.f. of X and Y is given by

$$f(x,y)=\frac{1}{8}(6-x-y),\quad 0\le x<2,\quad 2<y<4$$
$$=0 \qquad , \qquad otherwise$$

Find (i) $P(X<1\cap Y<3)$ (ii) $P(X+Y<3)$ (iii) $P(X<1/Y<3)$

12 (a) (i) State and prove addition theorem of Mathematical Expectation.
(ii) A coin is tossed until a head appears. What is the expectation of the number of tosses required.

**OR**

(b) (i) Define characteristic function of a random variable and state its properties and also prove any one of its properties.
(ii) State and prove Chebyshev's inequality.

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Code No. 7007

# FACULTY OF SCIENCE

B.Sc. I-Semester (CBCS) Examination, December 2017
Subject: Statistics
Paper – I: Descriptive Statistics and Probability

Time: 3 Hours Max. Marks: 80

## PART – A (5 x 4 = 20 Marks)
(Short Answer Type)

**Note: Answer any FIVE of the following questions.**

1 Explain Schedule.
2 Explain Kurtosis.
3 Write the condition for mutual independence for 4 events.
4 Define Axiomatic definition of probability.
5 Define (i) Probability mass function (ii) Probability density function
6 If $\begin{cases} 2x & 0 < x < 1 \\ 0 & otherwise \end{cases}$
Find pdf of y = 2x + 1.
7 State and prove Cauchy-Schwartz inequality.
8 If X is random variable, then var (ax + b)= $a^2$ Var (x), where a and b are constants.

## PART – B (4 x 15 = 60 Marks)
(Essay Answer Type)

**Note: Attempt ALL the questions.**

9 (a) What are various methods of collecting statistical data? Which is more reliable and why?

OR

(b) Establish the Relationship between central moments interms of Raw moments. Hence, obtain the first four moments.

10 (a) State and prove addition theorem of probability for 4 events.

OR

(b) (i) If A and B are independant, then show that $\bar{A}$ and B are independent.
(ii) State and prove Bayes theorem. Give its importance.

11 (a) Define Random variable. A random variable X has the following pmf.

| x=x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| P(x=x) | 0 | k | 2k | 2k | 3k | $k^2$ | $2k^2$ | $7k^2+k$ |

(i) Find K (ii) P (x ≤ 5), P(0 < x ≤ 3) (iii) If P (x ≤ x) > ½ , find the minimum value of x.

OR

..2

(b) Define Joint probability density function,. The Jpdf of x and y is

$$f(x,y)=\begin{cases} e^{-(x+y)} & x>0,\ y>0 \\ 0 & otherwise \end{cases}$$

(i) Verify whether x and y are independent (ii) p (x < 1) (iii) p (y > 2) (iv) P(x > 2, y < 3)

12 (a) (i) State and prove multiplication theorem of mathematical expectation.

(ii) Two unbiased dice are thrown. Find the expected value of the sum of number of points on them.

OR

(b) (i) Define cumulant generating function. Find the Relation between cumulants and moments.

(ii) Find the mgf of $y=\frac{x-m}{\sigma}$

G. Ravindra Reddy
Lec. in Statistics

Code No. 223/BL

# FACULTY OF SCIENCE

## B.Sc. I-Semester (CBCS)(Backlog) Examination, May/June 2017

### Subject : Statistics

### Paper – I : Descriptive Statistics and Probability

Time : 3 Hours

Max. Marks: 80

**PART – A (5 x 4 = 20 Marks)**
**(Short Answer Type)**

Note : Answer any FIVE of the following questions.

1. List out the Rules for tabulation.
2. Show that for a frequency distribution, $\beta_2 > 1$.
3. Give mathematical and statistical definitions of probability.
4. State and prove addition theorem of probability for two events.
5. A random variable X has the following probability distribution

| X=x | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| p(x) | 0.1 | K | 0.2 | 2k | 0.3 | 3k |

(i) Find k (ii) Evaluate $P(X < 2)$

6. Define marginal and conditional density function.
7. State the properties of characteristic function.
8. State and prove multiplication theorem of Expectation.

**PART – B (4 x 15 = 60 Marks)**
**(Essay Answer Type)**

Note: Attempt ALL the questions.

9 (a) (i) What do you understand by coefficient of variation? For what purpose it is used?

(ii) Following is the record of goals scored by team A in the football session.

| No. of goals scored | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| No. of matches | 1 | 9 | 7 | 5 | 3 |

For team B, the average number of goals scored per match was 2.5 and with a standard deviation of 1.25 goals. Find which team may be considered more consistent.

OR

(b) (i) Define Central and Non central moments. Derive the relationship between central moments in terms of raw moments.

(ii) In a certain distribution the first four moments about the point 5 are -4, 22, -117 and 560 respectively. Find mean, variance and $\beta_1$.

10 (a) (i) State and prove Baye's theorem.

(ii) From 6 positive and 8 negative numbers, 4 numbers are chosen at random without replacement and multiplied, what is the probability that the product is positive.

OR

(b) (i) If A and B are independent events then show that (1) $\bar{A}$ and B (2) A and $\bar{B}$ are also independent.

(ii) If $P(A \cup B) = \frac{5}{6}$; $P(A \cap B) = \frac{1}{3}$ and $P(\bar{B}) = \frac{1}{2}$, Prove that the events A and B are independent.

11 (a) (i) Define Distribution function of a random variable and state and prove its properties.

(ii) If $f(x) = 2x;\ 0 < x < 1$, find the probability density function of $Y = 8x^3$.

OR

(b) (i) Write the procedure for transformation of one-dimensional random variable.

(ii) The joint pdf of two-dimensional random variable (X, Y) is given by

$$f(x,y) = \begin{cases} kx^2 y, & 0 < x < 1;\ 0 < y < 1 \\ 0, & otherwise \end{cases}$$

(1) Find the value of k

(2) Find the marginal densities of x and y

(3) Mean of x

12 (a) Define MGF and CGF of a random variable. What is the effect of change of origin and scale on MGF and CGF.

OR

(b) (i) State and prove Chebyshev's Inequality.

(ii) A discrete random variable X takes the values 0, 1, 2, 3 with probabilities $\frac{1}{8}, \frac{3}{8}, \frac{3}{8}, \frac{1}{8}$ respectively. Evaluate $P\{|x - [illegible]| \geq 2\}$.

*****SSS

Code No. 229

# FACULTY OF SCIENCE

B.Sc. I-Semester (CBCS) Examination, December 2016

Subject : Statistics

Paper – I : Descriptive Statistics and Probability

Time : 3 Hours

Max. Marks: 80

## PART – A (5 x 4 = 20 Marks)

(Short Answer Type)

Note : Answer any FIVE of the following questions.

1. Explain the Sources of Secondary data.
2. Show that Bowley's coefficient of Skewness lies between ±1.
3. State the axioms of probability.
4. Show that if A and B are independent, $\bar{A}$ and $\bar{B}$ are also independent.
5. Define distribution function and state its properties.
6. Show that $V(aX + b) = a^2V(X)$.
7. Explain the procedure for transformation of a random variable.
8. State and prove additive property of CGF.

## PART – B (4 x 15 = 60 Marks)

(Essay Answer Type)

Note : Attempt ALL the questions.

9 (a) Distinguish between primary and secondary data. Explain the methods of collecting Primary data with advantages and disadvantages (5+10)

OR

(b) (i) Define Central and Non central moments. Derive the relationship between central moments in terms of a raw moments. (8+7)

(ii) In a certain distribution the first four moments about the point 5 are - 4, 2, -110 and 260 respectively. Find mean, variance and $\beta_2$.

10 (a) (i) For n events $E_1, E_2, \ldots E_n$. Prove that $P\left(\bigcap_{i=1}^{n} E_i\right) \geq \sum_{i=1}^{n} P(E_i) - (n-1)$.

(ii) A bag contains 50 tickets numbered 1,2 , ....50. Five tickets are drawn at random and arranged in as ascending order of magnitude What is the probability that the third ticket is 30? ([illegible]+5)

OR

(b) (i) State and prove addition theorem of probability for n events.

(ii) If $P(A \cup B) = \frac{5}{6}$; $P(A \cap B) = \frac{1}{3}$ and $P(\bar{B}) = \frac{1}{2}$. Prove that the events A and B are Independent.

11 (a) (i) Define Random variable, pmf and pdf.

(ii) A random variable X has the density function given by (1+2+2+3+3+4)

$f(x) = c\,(1 - x^2), -1 \le x \le 1$

Determine the constant c and find the mean and Variance.

OR

(b) A two dimensional random variable (X, Y) have a bivariate distribution given by

$$P(X = x, Y = y) = \frac{x^2 + y}{32}, \quad \text{for } x = 0, 1, 2 \text{ and } y = 0, 1$$

(i) Find the marginal distribution of X and Y

(ii) Conditional distribution of X = x given Y = 1

(iii) P(X < 1, Y= 0). (3+2+2+5+3)

12 (a) Define MGF and CGF of a random variable. Establish the relationship between moments and cumulants. (5+10)

OR

(b) (i) State and prove Chebyshev's in equality.

(ii) A r.v. 'x' is exponentially distributed with parameter 1. Find the density function of $Y = \sqrt{x}$.

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# PAPER-II

Code No. D-6206

# FACULTY OF SCIENCE

**B.A. / B.Sc. (CBCS) II - Semester (Regular & Backlog) Examination, June / July 2022**
**Subject: Statistics (Probability Distributions)**
**Paper – II**

Time: 3 Hours | Max. Marks: 80

## PART – A

**Note: Answer any eight questions.** (8 x 4 = 32 Marks)

1. Write short notes on Bernoulli distribution.
2. State and prove reproductive property of Binomial distribution.
3. Define Poisson distribution and obtain its mean.
4. Obtain the recurrence relation for the probabilities of Negative binomial distribution.
5. State and prove lack of memory property of Geometric distribution.
6. Show that Hyper Geometric distribution tends to binomial distribution.
7. Derive mean deviation about mean of Rectangular distribution.
8. Derive the odd order moments about mean of Normal distribution.
9. State and prove the reproductive property of Normal distribution.
10. Define Beta distribution of second kind. Find its mean and variance.
11. Define the general and standard Cauchy distribution.
12. Write short notes on Central Limit Theorem.

## PART – B

**Note: Answer all the questions.** **(4 x 12 = 48 Marks)**

13. (a) Define Binomial distribution. Obtain its m.g.f. and hence find its mean and variance.

**(OR)**

(b) Obtain the first four moments of Poisson distribution and derive coefficient of Skewness and Kurtosis.

14. (a) Stating the assumptions show that Poisson distribution is a limiting case of Negative binomial distribution.

**(OR)**

(b) Define Hyper Geometric distribution. Show that Hyper Geometric distribution tends to Binomial distribution.

15. (a) Define Rectangular distribution and hence find moments and Skewness.

**(OR)**

(b) Stating the assumptions show that Normal distribution as limiting case of Binomial distribution.

16. (a) Derive the following functions of Exponential distributions.
(i) Moment generating function (m.g.f.)
(ii)Cumulant generating function (c.g.f)
(iii)Characteristic function (c.f.)

**(OR)**

(b) Define Gamma distribution and obtain its moment generating function and hence find its mean and variance.

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Code No. D-7556

# FACULTY OF SCIENCE

B.A. / B. Sc. (CBCS) II - Semester (Backlog) Examination, June / July 2022

Subject: Statistics (Probability & Distributions)

Paper: II

Time: 3 Hours Max. Marks: 80

## PART – A

**Note: Answer any five questions.** **(5 x 4 = 20 Marks)**

1. If the M.G.F. $M_X(t) = (0.3 + 0.7\,e^t)^{10}$, then identify the distribution and find P(X=2)

2. The number of customers arriving at a bank is a poisson distribution with .4 customers per minute. Then what is the probability that there are 3 customers within 2 minutes?

3. Derive the mean of hypergeometric distribution.

4. In a surgical strike, the probability that a soldier hitting the target is 0.8. Each hit is independent of others. Then what is the probability that the target would be hit on the $6^{th}$ attempt?

5. Find the mean and variance of continuous uniform distribution.

6. State the central limit theorem and explain its importance.

7. Derive the mean of Beta distribution of second kind.

8. The marks obtained by the students in Mathematics, Statistics and Computer Science in an examination are normally distributed with mean 52, 50 and 48 and with standard deviations 10, 8 and 6 respectively. Find the probability that a student selected at random has secured a total of 180 or more marks? You are given that area between 0 and 2.12 is 0.4830.

## PART – B

**Note: Answer all the questions.** **(4 x 15 = 60 Marks)**

9. (a) Derive the moment generating function of the binomial distribution and hence deduce its mean and variance.

**(OR)**

(b) It is known that the probability of an item produced by a certain machine will be defective is 0.05. If the produced items are sent to the market in packets of 20, find the number of packets containing exactly, atleast and atmost 2 defective items in a consignment of 1000 packets using:
(i) Binomial distribution (ii) Poisson approximation to Binomial distribution.

10. (a) Prove that binomial distribution as a limiting case of hypergeometric distribution under certain conditions.

(OR)

(b) State and prove the additive property and lack of memory property of geometric distribution.

11. (a) The demand of cakes (in kg) at a bakery shows rectangular distribution in (200,300). Further the owner finds the distribution of profit as under, from his experience.

| Daily Demand(in kgs) | 200-225 | 225-250 | 250-300 |
|---|---|---|---|
| Average Profit(in Rs.) | 581.50 | 636.50 | 844.20 |

(i) Find the expected profit on a randomly chosen day.

(ii) Also find the probability that on a randomly selected day the demand lies between 210 kg and 260 kg.

(OR)

(b) A radar unit is used to measure speeds of cars on outer ring road of Hyderabad. The speeds are normally distributed with a mean of 90 kmph and standard deviation of 10 kmph. On average everyday nearly 2000 cars travel on the outer ring road. If the car speed exceeds 100 kmph, a fine of Rs.1000 will be imposed. Then

(i) Find the approximate amount per day that they collect in the form of fine.

(ii) What is the probability that a randomly selected car is travelling between 80 kmph and 100 kmph?
(You are given that Z lies between 0 and 1 is 0.3413)

12. (a) Derive the moment generating function of Gamma distribution and hence deduce its mean and variance from it.

(OR)

(b) Find the four central moments of an exponential distribution. Also give three real life examples of an exponential distribution where it is used.

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04-10-2021 [P.N.]

Code No. 18037/O

# FACULTY OF SCIENCE

## B.A./B.Sc. II Semester (CBCS) Examination, September/October 2021

### Subject: Statistics
### Paper – II : (Probability Distributions)

Time: 2 Hours | Max. Marks: 80

## PART – A

(4 x 5 = 20 Marks)

**Note: Answer any four questions.**

1 Derive mode in case of Poisson distribution.
2 Define negative Binomial distribution. Derive its m.g.f.
3 Derive recurrence formula for the moments of Binomial distribution.
4 Define Geometric distribution. Obtain its mean and variance.
5 State properties of normal distribution.
6 State and prove memory less property of exponential distribution.
7 Define general Gamma distribution. Derive its m.g.f.
8 Define Cauchy distribution. Show that moments does not exist in case of Comely distribution.

## PART – B

(3 x 20 = 60 Marks)

**Note: Answer any three questions.**

9 Define Binomial distribution obtain c.g.f. for the same and hence find $\beta_1$ & $\beta_2$. Comment on the deductions.

10 Define hyper geometric distribution. Stating assumptions derive Binomial distribution as a limiting case of hypergeometric distribution.

11 Define Poisson distribution. Derive $\beta_1$ & $\beta_2$ for the same and comment.

12 Show that Binomial distribution tends to the normal distribution.

13 Define normal distribution. Derive its m.g.f. state and prove additive property of normal distribution.

14 Define exponential distribution. Derive $\beta_1$ & $\beta_2$ for the same and comment on the nature of exponential distribution.

15 Show that for normal distribution mean = median = mode =m.

16 Define the general and standard Cauchy distribution. Derive its characteristic function. State and prove its reproductive property.

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# FACULTY OF SCIENCE

B.Sc. II-Semester (CBCS) Examination, May / June 2019 Code No. 3037

Subject : Statistics

Time : 3 Hours Paper – II : Probability Distribution

Max. Marks: 80

## PART – A (5 x 4 = 20 Marks)

(Short Answer Type)

Note : Answer any FIVE of the following questions.

1 Find the mean and variance of the following uniform distribution which is obtained by tossing a die:

$$f(x) = \begin{cases} 1/6 & , \quad x = 1, 2, 3, 4, 5, 6 \\ 0 & , \quad otherwise \end{cases}$$

2 Determine the Binomial Distribution for which the mean is 4 and variance is 3. Also find its mode.

3 Derive the Moment Generating function of a Poisson Distribution.

4 Find the mean of Negative Binomial Distribution.

5 The Random variable 'X' is Normally Distributed with mean $\mu$ = 30 and standard Deviation $\sigma$ = 4. Find (i) P(X < 40) (ii) P(X > 21) [You are given that (i) area between 0 and 2.5 is 0.4938, (ii) area between 0 and 2.25 is 0.4878].

6 Derive the mean of an Exponential Distribution.

7 Find the moment generating function of Gamma Distribution.

8 State any two properties of Cauchy Distribution.

## PART – B (4 x 15 = 60 Marks)

(Essay Answer Type)

Note: Answer ALL the questions.

9 (a) Derive first three central moments of a Binomial Distribution.

OR

(b) Obtain the Moment Generating function of a Poisson Distribution and hence calculate mean and variance from it.

10 (a) A taxi cab company has 12 Maruti Swift cars and 8 Tata Indica cars. If 5 of these cars are in workshop for repair and Swift car is likely to be in for repairs as Indica car, what is the probability that.

(i) Out of 5 cars, x of them are Swift cars in workshop for repairs.

(ii) All the 5 are of the same make.

(iii) Find the expected value of x i.e.E(x).

OR

(b) Stating the conditions, prove that Poisson Distribution as a limiting case of the Negative Binomial Distribution.

29

11 (a) Show that for a Normal Distribution.

Q.D : M.D : S.D : 10 : 12 : 15

OR

(b) In Hyderabad Metro trains arrive at a station at 15 minutes interval starting at 5 a.m. If a passenger comes to a station at a time that is uniformly distributed between 9 a.m. and 9.30 a.m., find the probability that the passenger has to wait for the train for

(i) Less than 6 minutes

(ii) more than 10 minutes

(iii) also find the mean and variance of waiting time.

12 (a) Derive the mean and variance of

(i) Beta Distribution of first kind (ii) Gamma Distribution

OR

(b) A component has an exponential time to its failure distribution with the mean of 10,000 hours.

(i) What is the probability that it will fail by 15,000 hours given that component is already seen in operation for its mean life time.

(ii) What is the probability that it operates for another 5, 000 hours given that it is operation at 15,000 hours.

(iii) Also find the variance of the failure time.

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Code No. 7036

# FACULTY OF SCIENCE

B.Sc. II-Semester (CBCS) Examination, May / June 2018

Subject : Statistics

Paper – II : Probability Distributions

Time : 3 Hours

Max. Marks: 80

## PART – A (5 x 4 = 20 Marks)
(Short Answer Type)

**Note : Answer any FIVE of the following questions.**

1 Define uniform distribution. Obtain its mean.

2 Define Poisson distribution. State its reproductive property.

3 From a consignment, 15 record players are selected at random, one by one, and examined. Those examined are not put back. What is the probability that $9^{th}$ record examined is the third and the last defective.

4 State the memory less property of geometric distribution.

5 The mean of a normal distribution is 60 and 6% of the values are greater than 70. Find the standard deviation. $P[0 < z < 1.56] = 0.44$

6 Obtain the mean and variance of exponential distribution.

7 Define Beta distribution of first kind and find its mean.

8 Define Cauchy distribution. Give its applications.

## PART – B (4 x 15 = 60 Marks)
(Essay Answer Type)

**Note: Answer all the questions.**

9 (a) Define Binomial distribution. Derive its mean and mode.

OR

(b) Obtain $\beta_1$ & $\beta_2$ for a Poisson distribution. Also comment on its skewness and kurtosis.

10 (a) Define hypergeometric distribution. Derive its mean and variance.

OR

(b) Derive Poisson distribution as a limiting case of negative Binomial distribution.

11 (a) Derive standard deviation, mean deviation about mean and quartile deviation for normal distribution.

OR

(b) Show that normal distribution is a limiting case of Binomial distribution.

12 (a) Define Gamma distribution. Obtain its moment generating function and hence find its mean and variance.

OR

(b) Derive moment generating function of Exponential distribution. Show that the sum of exponential random variables is a gamma random variable.

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Code No. 267

# FACULTY OF SCIENCE

B.Sc. II-Semester (CBCS) Examination, May/ June 2017

Subject : Statistics

Paper – II : Probability Distributions

Time : 3 Hours

Max. Marks: 80

## Section - A (5x4=20 Marks)
## (Short Answer Type)

1 Derive mean for Binomial distribution.
2 Define Negative Binomial random variable. Derive its m.g.f.
3 State and prove reproductive property for Poisson random variables.
4 Define Geometric random variable. State and prove its memory-less property.
5 Define Rectangular distribution. Derive its variance.
6 Define Normal distribution. Explain its Area property with the help of an example.
7 What is Exponential distribution? Derive its cumulant generating function.
8 Define Cauchy distribution state and prove its additive property.

## Section - B (4x15=60 Marks)
## (Essay Answer Type)

9 (a) Stating the assumptions show that Poisson distribution is a limiting case of Binomial distribution.

OR

(b) Derive cumulant generating function for Poisson distribution and hence find $\beta_1$& $\beta_2$ also comment on skewness and Kurtosis of Poisson distribution.

10 (a) Define hypergeometric distribution. Show that hypergeometric distribution tends to binomial distribution.

OR

(b) Stating the assumptions show that Poisson distribution is a limiting case of negative Binomial distribution.

11 (a) Show that in case of Normal distribution
S.D. : M.D. : S.D. : : 10 : 12 : 15

OR

(b) Define Gamma distribution. Obtain its m.g.f. and hence obtain its mean and variance.

12 (a) Define Exponential distribution. Define its m.g.f. and hence find $\beta_1$& $\beta_2$. Comment on the shape of Exponential distribution.

OR

(b) Show Normal distribution as a limiting case of
(i) Binomial distribution
(ii) Gamma distribution

# PAPER-III

## FACULTY OF SCIENCE

Code No: D-7606

**B.A. / B.Sc. (CBCS) III - Semester (Backlog) Examination, August 2022**

Subject: Statistics

Paper – III: Statistical Methods

Time: 3 Hours

Max. Marks: 80

### PART – A

Note: Answer any five questions (5 x 4 = 20 Marks)

1. Define regression and state the properties of regression coefficient.
2. Explain the method of least squares.
3. Define multiple correlation coefficient.
4. Define Yule's coefficient of association.
5. Define F-distribution and state its applications.
6. Define: a) Point estimation b) Interval estimation.
7. State the asymptotic properties of MLE.
8. Let $X_1, X_2, \ldots X_n$ be a random sample from b(n,p), then find the sufficient estimator for p.

### PART – B

**Note: Answer all the questions** **(4 x 15 = 60 Marks)**

9. a) Define correlation and derive the properties of correlation coefficient.

**OR**

b) Derive the normal equations for fitting the power curve using principle of least squares.

10. a) What is consistency of data in attributes? Explain the conditions of consistency of data.

**OR**

b) Define partial correlation for three variables. In a trivariate distribution, $r_{12} = 0.7$, $r_{23} = r_{31} = 0.5$, then find partial correlation coefficient $r_{23.1}$ and multiple correlation coefficient $R_{1.23}$.

11. a) Define t – statistic and distribution. State the properties and applications of t-distribution.

**OR**

b) $X_1, X_2, \ldots X_n$ be a random sample of size 'n' from Poisson population with parameter 'λ'. Find the consistent estimator for 'λ'.

12. a) Explain the method of maximum likelihood estimation.

**OR**

b) Let $X_1, X_2, \ldots X_n$ be a random sample of size 'n' from normal population with parameters $\mu$ and $\sigma^2$. Derive the estimators for $\mu$ and $\sigma^2$ by the method of moments.

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Code No. D-6318/BL

# FACULTY OF SCIENCE

## B.A. / B.Sc. (CBCS) III Semester (Backlog) Examination, August 2022

### Subject: Statistics
### Paper – III : Statistical Methods and Theory of Estimation

Time: 3 Hours | Max. Marks: 80

PART – A

Note: **Answer any eight questions.** (8 x 4 = 32 Marks)

1. Explain the concept of two lines of regression.
2. Define correlation ratio and its necessity of study.
3. Distinguish between correlation and regression.
4. Define Partial correlation and write its measures.
5. Define order of a class and ultimate classes.
6. Write a short note on independence of attributes.
7. Define point estimation and interval estimation.
8. Define F distribution and state its applications.
9. Explain the concept of consistency with an example.
10. State the asymptotic properties of MLE.
11. Derive the method of moment estimator for Bernoulli distribution.
12. State Neymann Factorization theorem.

**PART – B**

Note: **Answer all the questions.** **(4 x 12 = 48 Marks)**

13. (a) Define Spearman's rank correlation and derive its limits.

**(OR)**

(b) Derive the Regression line of Yon X.

14. (a) Define consistency of data. Give the conditions for consistency of three attributes.

**(OR)**

(b) Establish the relationship between Yule's coefficient of association and coefficient of colligation.

15. (a) Define $\chi^2$ distribution. State the properties and applications of t distribution.

**(OR)**

(b) Explain the characteristics of a good estimator.

16. (a) Write short notes on method of moments. Find the MLE for the parameter $\lambda$ of Poisson distribution on the basis of sample of size n. Also find its variance.

**(OR)**

(b) Explain confidence interval and hence for a sample of 400 observations from normal population with mean 95 and SD 12. Find 95% confidence limits for the population mean.

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35

10-03-2022 [AN]

Code No. 6318

# FACULTY OF SCIENCE

## B.Sc. / B.A. III Semester (CBCS) Examination, March 2022

## Subject: Statistics

## Paper – III : Statistical Methods and Theory of Estimation

Time: 3 Hours

Max. Marks: 80

### PART – A

**Note: Answer any eight questions.** (8 x 4 = 32 Marks)

1. Explain the principle of least squares.
2. What is scatter diagram? Explain different types of correlations using scatter diagram.
3. Define spearman's rank correlation. State its properties and applications.
4. Explain how to analyse categorical data.
5. Explain multiple correlation coefficient and state its properties.
6. Define positive association and negative association.
7. State the properties of t distribution.
8. Define unbiasedness and consistency of an estimator with suitable examples.
9. Explain about interval estimation with an example.
10. State the properties of maximum likelihood estimator.
11. Explain method of moments.
12. State Neymann Factorization theorem.

### PART – B

**Note: Answer any four questions.** **(4 x 12 = 48 Marks)**

13 Derive the normal equations for fitting of a curve of the form
i. $Y= ab^x$ ii. $Y=ae^{bx}$

14 Define regression. State and prove its properties.

15 Explain partial correlation with an example. If $r_{12}=0.77$, $r_{13}=0.72$ and $r_{23}=0.52$. Find Values of $R_{1.23}$, $R_{2.13}$ and $R_{3.12}$.

16 Define Yule's coefficient of association. Establish the relationship between Yule's coefficient of association and Yule's coefficient of colligation.

17 Define F distribution. State the properties and applications of F distribution.

18 Derive the relationship between F and $\chi^2$ distributions.

19 Find the sufficient estimator for binomial and exponential distributions.

20 The mean and standard deviation of a population are 1795 and 14054 respectively. Find the 95% confidence interval for the maximum error $\overline{X}$=11795 and n=50.Find the confidence limits for the mean if X=84.

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Code No. 18075/N/BL

# FACULTY OF SCIENCE

B.A / B.Sc. III-Semester (CBCS) Examination, November / December 2021

Sub: Statistics

Paper – III : Statistical Methods and Theory of Estimation

Time: 2 Hours Max.Marks:80

## PART – A

**Note: Answer any five questions.** (5 x 4 = 20 Marks)

1 Derive normal equations for second degree parabola.

2 Compare correlation analysis and regression analysis.

3 State the properties of Karl-Pearson correlation coefficient.

4 Define partial and multiple correlation coefficients.

5 Show that for 'n' attributes $A_1, A_2, \ldots A_n$

$$(A_1 A_2 \ldots A_n) \geq (A_1) + (A_2) + \ldots + (A_n)$$

6 Define: i) independence of attributes ii) association of attibutes.

7 State the interrelationships between t, f and $\chi^2$ distribution.

8 Define consistency and unbiasedness of a point estimator.

9 Define: i) sampling distribution ii) standard error

10 Write about interval estimation.

11 Derive method of moments estimator for Poisson parameter $\lambda$.

12 State Nayman's Factorization theorem.

## PART – B

**Note: Answer any three questions.** (3 x 20 = 60 Marks)

13 Derive the formula for Spearman's rank correlation coefficient.

14 Derive the expression for correlation ratio $\eta$.

15 Define the coefficient of association (Q) and colligation (Y). Derive the relation between Q and Y.

16 Define consistency of data. Examine consistency of the following data.

$N = 1000, \ (A) = 600, \ (B) = 500, \ (AB) = 50$

17 Derive the Sufficient estimator for the parameter 'θ' of exponential distribution.

....2

18 Define $\chi^2$ distribution and state its properties.

19 Explain method of maximum likelihood estimation.

20 Find 95% confidence interval of mean of normal distribution when variance is known.

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Code No. 18075/O/BL

# FACULTY OF SCIENCE

B.A. / B.Sc. III Semester (CBCS) Examination, November / December 2021

**Subject: Statistics**
**Paper – III : (Statistical Methods)**

Time: 2 Hours

Max. Marks: 80

## PART – A

**Note: Answer any four questions.** (4 x 5 = 20 Marks)

1. Define Spearman's rank correlation and state its properties.
2. Show that two independent variables are uncorrelated.
3. Define partial correlation coefficient.
4. What is an association of attributes?
5. Define t-distribution and state its applications.
6. Define: a) unbiasedness b) consistency.
7. State Neyman's Factorization theorem.
8. State the asymptotic properties of MLE.

## PART – B

**Note: Answer any three questions.** (3 x 20 = 60 Marks)

9 Define regression and derive the properties of regression coefficients.

10 Derive the normal equations for fitting the curve of the form $Y = ae^{bX}$ by using principle of least squares.

11 Define Yule's coefficient of association and establish the relationship between Yule's coefficient and coefficient of colligation.

12 Define multiple correlation for three variables. In a trivariate distribution, $r_{12} = 0.77$, $r_{13} = 0.72$, $r_{23} = 0.52$, then find the partial correlation coefficient $r_{12.3}$ and multiple correlation coefficient $R_{1.23}$.

13 Define $\chi^2$ distribution and state its properties and applications.

14 Explain the criteria for a good estimator.

15 Explain the method of moments.

16 Let $X_1, X_2, \ldots X_n$ be a random sample of size 'n' from normal population with parameters $\mu$ and $\sigma^2$. Derive the sufficient estimators for $\mu$ and $\sigma^2$.

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39

20

Code No. 18075

# FACULTY OF SCIENCE

## B.Sc. / B.A. III-Semester Examination, July 2021

Subject : Statistics

Paper – III : Statistical Methods and Theory of Estimation

Time : 2 Hours  Max. Marks: 80

### PART – A

**Answer any five questions.** (5x4=20 Marks)

1 Explain the concept of correlation. Give two examples.
2 Define principle of least squares. Derive normal equations for straight line.
3 Derive limits of correlation coefficient r(x, y).
4 Define attribute and state the conditions to be verified for consistency of 3 attributes data.
5 If A and B are two independent attributes, the show that $(AB) = \frac{(A)(B)}{N}$.
6 Examine consistency of the following two attributes data.
 N = 1000, (A) = 600, (B) = 500 and (AB) = 50.
7 Define Sampling distribution and standard error.
8 What is point estimation? Explain. Also explain the concept of Bias of an estimator.
9 Define 't' distribution and state its properties.
10 Describe method of moments estimation.
11 Derive maximum likelihood estimator of exponential parameter θ.
12 Derive sufficient estimator of Poisson Parameter λ.

### PART – B

**Answer any three questions.** (3x20=60 Marks)

13 State and prove properties of regression coefficients.

14 Derive the limits for Spearman's rank correlation coefficient.

15 Define independence of attributes. Derive three criterion to establish independence of attributes.

16 Define ultimate frequency in theory of attributes. Given the following ultimate frequencies, find the positive class frequencies.
 (ABC)=149 (ABγ)=738 (AβC)=225 (Aβγ) =1,196
 (αBC)=204 (αBγ)=1,762 (γβC)=171 (αβγ)=21,842

17 Define the criterion for good estimator.

18 State and prove the relations between t, F and $\chi^2$ distributions.

19 State the properties of maximum Likelihood estimator.

20 Find Maximum Likelihood estimator for mean and variance of normal distribution.

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Code No. 8075

# FACULTY OF SCIENCE

**B.Sc. III – Semester (CBCS) Examination, October/November 2020**

**Subject: Statistics**

**Statistical Methods**

**Paper – III (DSC)**

Time: 2 Hours Max.Marks: 80

## PART – A (4 x 5 = 20 Marks)

**Note : Answer any four questions.**

1 Define correlation. Explain different types of correlation with examples.
2 Prove that two independent variables are uncorrelated, but the converse need not be true
3 Define consistency of data. Give the conditions of consistency for two variables.
4 Explain multiple correlation. Give the formulae for the computation of multiple correlations.
5 Define:
a) Population b) Population c) Parameter d) Random sample
d) Statistic
6 Define:
a) Point estimation b) Interval estimation
7 State Neyman's Factorization Theorem
8 Explain the concept of mean square error and bias of an estimator.

## PART – B (3 x 20 = 60 Marks)

**Note: Answer any three questions.**

9 Define Spearman's rank correlation coefficient and derive its limits.

10 What is regression analysis? State and prove the properties of regression coefficients.

11 Define Yule's coefficient of association. Establish the relationship between Yule's coefficient of association and coefficient of colligation.

12 i) Define partial correlation for three variables and give the formulae for the same.
ii) In a trivariate distribution it is found that
$\gamma_{12} = 0.7$, $\gamma_{13} = 0.61$, $\gamma_{23} = 0.4$. Find $\gamma_{12.3}$, $\gamma_{13.2}$, $\gamma_{23.1}$.

13 Define Fisher's t-distribution and state its properties and applications.

14 What are the criteria for a good estimator? Define them.

15 Derive the sufficient statistics for $\mu$ and $\sigma^2$ in a normal distribution based on a random sample of size 'n' from the same.

16 i) Explain method of moments.
ii) Obtain 99% confidence interval for the population parameter $\mu$ in the normal population, when $\sigma^2$ is known.

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1110-18461-033

Code No. 8075

# FACULTY OF SCIENCE

**B.Sc. III – Semester (CBCS) Examination, November / December 2019**

**Subject: Statistics**
**Statistical Methods**
**Paper – III (DSC)**

**Time: 3 Hours** **Max.Marks: 80**

## PART – A (5x4 = 20 Marks)
**(Short Answer Type)**

**Note:** Answer any FIVE of the following questions.

1 What is scatter diagram? Show different types of correlations using scatter diagram.
2 Explain why two lines of regression exist.
3 Define partial association. Give the formulae for computation of partial association.
4 Define:
   a) Attributes  b) Positive Association
   c) Negative association  d) Independence of attributes
5 Define: a) Unbiasedness  b) Consistency.
   Give one example for each.
6 Define sampling distribution and standard error.
7 Write about Interval estimation.
8 Explain estimation by method of moments.

## PART – B (4x15 = 60 Marks)
**(Essay Answer Type)**

**Note:** Answer all questions.

9 a) Derive the normal equations for fitting of a curve of the form:
   i) $Y = ab^x$  ii) $Y = ae^{bx}$

**OR**

b) Derive the regression equation of X on Y.

10 a) i) Define multiple correlation for three variables and give the formulae for the same.
   ii) Calculate $R_{1.23}$, $R_{2.13}$ and $R_{3.12}$ if $r_{12} = 0.6$; $r_{13} = 0.7$; $r_{23} = 0.65$.

**OR**

b) i) Define consistency of data. Give the conditions for consistency of three attributes.
   ii) If (A) = 450, (B) = 650; (AB) = 310, N = 1000. Find whether A and B are independent or associated.

11 a) Define Chi-square Distribution. Derive the relationship between F and Chi-square distributions.

**OR**

b) Let $x_1, x_2, \ldots, x_n$ be a random sample from normal population with mean $\mu$ and variance $\sigma^2$. Show that sample mean is an unbiased estimator of population mean and sample variance is not an unbiased estimator of population variance.

12 a) State Neyman Factorization Theorem. Find a sufficient estimator to the parameter $\lambda$ in Poisson distribution based on a random sample of size 'n' from the same.

**OR**

b) Explain the method of maximum likelihood estimation. Obtain MLE for $\theta$ in exponential distribution based on a random sample $x_1, x_2, \ldots, x_n$ from the same.

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Code No. 3074

# FACULTY OF SCIENCE

B.Sc. III-Semester (CBCS) Examination, November / December 2018

Subject : Statistics

Paper – III : Statistical Methods (DSC)

Time : 3 Hours

Max. Marks: 80

## PART – A (5 x 4 = 20 Marks)
(Short Answer Type)

**Note : Answer any FIVE of the following questions.**

1 State the principle of least squares.
2 Define Correlation Ratio and its necessity of study.
3 Write short notes on independence of attributes.
4 Define multiple correlation and write its measure of computation.
5 Define Standard error. Write the standard errors for sample mean and variances.
6 Write about Point estimation. State the properties of chi-square distribution.
7 State Neymann Pearson Factorization theorem.
8 Explain the concept of Mean Square Error of an estimate.

## PART – B (4 x 15 = 60 Marks)
(Essay Answer Type)

**Note: Answer ALL questions.**

9 (a) Define Karl Pearson Coefficient of Correlation. State and prove its properties.

OR

(b) Define Regression and derive the Regression equation of Y on X.

10 (a) State the conditions for consistency of Data for a single attribute A, for two attributes A and B and for three attributes A, B and C.

OR

(b) Find the remaining class frequencies from the following information.
$(ABC) = 57$, $(\alpha\beta\gamma)=8310$, $(AB\gamma)=281$, $(\alpha BC)=78$, $(\alpha B\gamma) = 620$ $(A\beta C)=86$, $(\alpha\beta C)=65$, $(A\beta\gamma)=453$.

11 (a) Define F – distribution. State its properties and applications.

OR

(b) Explain the characteristics of a good estimator.

12 (a) Write the method of moment estimation. Let $X_1, X_2....X_n$ be a random sample of size n drawn from Poisson population with parameter $\lambda$, estimate the parameter $\lambda$ using method of moments.

OR

(b) Obtain the confidence intervals for the parameter $\mu$ based on the sample of size n drawn from Normal $(\mu, \sigma^2)$ $\sigma^2$ is unknown by Pivot method.

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Code No. 7070 / BL

# FACULTY OF SCIENCE

B.Sc. (CBCS) III – Semester (Backlog) Examination, May / June 2018

Subject : STATISTICS

Paper – III

Statistical Methods

Time : 3 hours

Max. Marks : 80

## Part – A (5 X 4 = 20 Marks)
(Short Answer Type)

*Answer any Five of the following questions.*

1 Explain the principle of least squares.
2 Distinguish between correlation and regression.
3 State the formula for the computation of multiple correlation coefficient for three variables.
4 Explain about the independence of attributes.
5 State the relationship between t and F distributions.
6 Define efficiency of estimator with an example.
7 Describe the procedure for the method of moments for an estimator.
8 Define the point and interval estimations.

## Part – B (4 X 15 = 60 Marks)
(Essay Answer Type)

*Answer ALL questions from the following :*

9 a) i) Define curve fitting. State the normal equations for fitting of a straight line $y = a+bx$. Using least squares method.

ii) Derive the normal equations for fitting of second degree (parabola) $y = a+bx+cx^2$.

OR

b) i) Define Karl Pearson's correlation coefficient (r) and obtain its limits.

ii) Show that correlation coefficient (r) is independent of change of origin and scale.

10 a) i) Define partial correlation for three variables and state the formulae for the computation of $r_{12.3}$, $r_{13.2}$ and $r_{23.1}$.

ii) If $r_{12} = 0.80$, $r_{13} = -0.40$ and $r_{23} = -0.56$. Find the values of $r_{12.3}$, $r_{13.2}$ and $r_{23.1}$.

OR

b) i) Define consistency of data. Explain the conditions for the consistency of data.

ii) Examine the consistency of the following data : N = 1000 ; (A) = 600 ; (B) = 500 ; (AB) = 50, the symbols having their usual meaning.

11 a) i) Define F-distribution. State its properties and applications.
ii) State the applications of t-distribution.

OR

b) i) What are the characteristics of a good estimator?
ii) Let $x_1, x_2, \ldots x_n$ is a random sample from a $N(\mu, 1)$ population. Show that $t = \frac{1}{n}\sum_{i=1}^{n} x_i^2$ is an unbiased estimator of $\mu^2+1$.

12 a) Let $x_1, x_2, \ldots x_n$ be a random sample from the p.d.f. $f(x, \theta) = \theta e^{-\theta x}; 0 < x < \infty$, $\theta > 0$. Estimate $\theta$ by a) method of moments b) method of MLE.

OR

b) i) Explain the concept of confidence interval and confidence limits.
ii) A random sample of size 4 is taken from a population having the $N(\mu, 0.09)$ distribution. The observation were 12.6, 13.4, 12.8 and 13.2. Find 95% confidence interval of $\mu$.

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Code No. 7070

FACULTY OF SCIENCE

B.Sc. (CBCS) III – Semester Examination, December 2017

Subject : STATISTICS

Paper – III

Statistical Methods

Time : 3 hours

Max. Marks : 80

*Part – A (5 X 4 = 20 Marks)*

(Short Answer Type)

*Answer any Five of the following questions.*

1 Explain the scattered diagram method for measuring the correlation.
2 Explain the concept of two lines of regression.
3 State the formula for the computation of a partial correlation coefficients for three variables.
4 Define i) order of a class ii) Ultimate classes
5 Define i) Population parameter and ii) Sample statistic with examples.
6 Define unbiasedness of an estimator with an example.
7 State the properties of Maximum likelihood estimator.
8 Define interval estimation.

*Part – B (4 X 15 = 60 Marks)*

(Essay Answer Type)

*Answer ALL questions from the following:*

9 a) i) Obtain the formula for spearman's rank correlation coefficient.
ii) Derive the normal equations for fitting of a curve of the type $y = ax^b$.

OR

b) i) Derive the Regression line of Y on X.
ii) State and prove the properties of regression coefficients.

10 a) i) Define multiple correlation with an example for three variables and state the formula for $R_{1.23}$, $R_{2.13}$ and $R_{3.12}$.
ii) If $r_{12} = 0.77$, $r_{13} = 0.72$ and $r_{23} = 0.52$. Find the values of $R_{1.23}$, $R_{2.13}$ and $R_{3.12}$.

OR

b) i) Define positive association, negative association and independence of attributes.
ii) Derive the relationship between Yule's coefficient of association and coefficient of colligation.

11 a) i) Define sampling distribution of a statistic and standard error.
ii) Define $\chi^2$ - distribution. State its properties and applications.

OR

b) i) Define consistency and sufficiency with examples.
ii) State and prove sufficient conditions for consistency.

12 a) i) State Neyman's Factorization theorem.
ii) Find the sufficient estimator for $\theta$ in case of exponential distribution.

OR

b) i) Explain the method of MLE.
ii) Find the MLE for the parameter $\lambda$ of Poisson distribution on the basis of sample of size n. Also find its variance.

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# PAPER-IV

Code No. D-6418

# FACULTY OF SCIENCE

**B.A. / B. Sc. (CBCS) IV - Semester (Regular & Backlog) Examination,**
**June / July 2022**
**Subject: Statistics**
**Paper - IV: Statistical Inference**

**Time: 3 Hours** **Max. Marks: 80**

## PART – A

**Note: Answer any eight questions.** (8 x 4 = 32 Marks)

1. Explain the steps in testing of hypothesis.
2. Define null and alternate hypothesis. Give one example for each.
3. Explain one tailed and two tailed tests and define test functions. Give one example for each.
4. State the distributions of different order statistics.
5. Describe the test procedure for large sample test.
6. Explain Fishers Z-transformation for a population correlation coefficient.
7. Describe students t-test for single mean.
8. Explain $x^2$– test for goodness of fit.
9. Describe small sample test for significance of sample correlation coefficient.
10. State advantages of nonparametric tests.
11. Explain about use of central limit theorem in testing.
12. Describe one sample sign test.

## PART – B

**Note: Answer all the questions.** (4 x 12 = 48 Marks)

13. (a) State and prove Neyman – Pearsons lemma for randomised tests.

(OR)

(b) Let $X_1$, $X_2$.....$X_n$ be a random sample of size 'n' from a binomial population. Find the best critical region for testing $H_0$: $p > p_o$ against $H_1$: $p > p_o$ at $\alpha$ % level of significance.

14. (a) Explain large sample test procedure for difference of standard deviations.

(OR)

(b) Explain large sample test procedure for difference of population proportions.

15. (a) Derive $x^2$– test statistic for testing the independence of attributes in 2xk contingency table.

(OR)

(b) Explain t-test procedure for testing the two independent and dependent samples.

16. (a) Explain about different measurement of scale. Give two examples for each.

(OR)

(b) Explain in detail about Wald Wolfowitz run test procedures along with ties and large sample approximations.

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**Code No. D-7656**

# FACULTY OF SCIENCE

**B.A. / B.Sc. (CBCS) IV Semester (Backlog) Examination, June / July 2022**

**Subject: Statistics**
**Paper – IV: Inference**

**Time: 3 Hours** **Max. Marks: 80**

## PART – A

**Note: Answer any five questions.** **(5 x 4 = 20 Marks)**

1. Define one tailed and two tailed tests, level of significance and power of a test. Give one example for each.
2. Define type I and type II errors, null and alternate hypothesis. Give two examples for each.
3. Describe large sample test for single mean.
4. Define order statistic and state their distributions.
5. Explain t-test for paired observations.
6. Explain $x^2$- test for goodness of fit.
7. Describe one sample run test.
8. Describe Wilcoxon-signed rank test for one sample.

## PART – B

**Note: Answer all the questions.** **(4 x 15 = 60 Marks)**

9. (a) State and prove Neymann-Pearson Lemma.

(OR)

(b) Let $X_1, X_2, \ldots\ldots X_n$ be a random sample drawn from exponential population with parameter θ. Derive the best critical region for testing $H_o : \theta = \theta$ againt $H_1 : \theta > \theta_o$ at $\alpha\%$ level of significance.

10. (a) Describe the large sample test procedure for difference of proportions.

(OR)

(b) Explain test for difference of correlation coefficients using Fisher's Z-transformation.

11. (a) Derive the $X^2$ –test statistic for independence of attributes in 2x2 contingency table.

(OR)

(b) Explain tests for independence of attributes in an r x s contingency table.

12. (a) Describe Wald-Wolfowitz runs test for small samples along with large sample approximation.

(OR)

(b) (i) Explain about different measurement scales.
(ii) Compare sign test and signed rank test.

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Code No. 9776

# FACULTY OF SCIENCE

B.Sc. IV Semester (CBCS) Examination, January / February 2021

**Subject : Statistics**

**Paper – IV – Inference**

Time : 2 Hours Max. Marks: 80

## PART – A

**Note: Answer any four questions.** (4 x 5 = 20 Marks)

1 Define null-hypothesis and alternate hypothesis, critical region and power of test. Give one example for each.

2 Define randomized and non-randomized test functions. Give two examples for each.

3 Describe large sample test for single proposition.

4 Explain Fisher's z-transformations for two samples and associated test procedure.

5 Explain t-test for single mean.

6 Explain $\chi^2$ – test for 2x2 contingency table for independence of attributes.

7 Explain use of central limit theorem in testing. Give two examples.

8 Describe one sample sign test.

## PART – B

**Note: Answer any three questions.** (3 x 20 = 60 Marks)

9 Let $x_1, x_2, \ldots\ldots\ldots, x_n$ be a random sample from poisson population with parameter $\lambda$. Obtain the best critical region for testing $H_0 : \lambda = \lambda_0$ against $H_1 : \lambda > \lambda_0$ at $\alpha$% level of significance.

10 State and prove Neyman – Pearson lemma.

11 Explain the large sample test procedure for difference of standard deviations.

12 Explain the large sample test procedure for difference of means.

13 Describe the test procedures based on Snedecor's F-distribution for homogeneity of population variances and $\chi^2$ – test procedure for population variance.

14 Explain the test procedures for sample correlation coefficient based on students t-distribution and paired t-test.

15 Explain two sample signed rank test for small samples along with its large sample approximation. Compare the same with sign test.

16 (i) Describe Mann-Whitney u-test for small samples. Also give its large sample approximation.

(ii) Compare parametric and non-parametric test.

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Code No. 18125/N

# FACULTY OF SCIENCE

## B.A./B.Sc. IV Semester (CBCS) Examination, September/October 2021

**Subject: Statistics**
**Paper – IV: Statistical Inference**

Time: 2 Hours | Max. Marks: 80

### PART – A

**Note: Answer any five questions.** (5 x 4 = 20 Marks)

1 Define randomised and non-randomised test functions. Give one example for each.
2 Define two types of errors, level of significance and power of a test.
3 Explain steps involved in testing of hypothesis.
4 Define order statistics. Give two examples.
5 Describe the test procedure for large sample test for single mean.
6 Explain Fisher's Z-transformation for one sample.
7 Explain small sample test for population variance.
8 Explain Snedecor's F-test for equality of population variances.
9 Explain t-test for dependent samples.
10 Write about ordinal and ratio scales. Give two examples for each.
11 Explain about one sample run test.
12 State advantages and disadvantages of non parametric tests.

### PART – B

**Note: Answer any three questions.** (3 x 20 = 60 Marks)

13 State and prove Neyman-Pearson's lemma for randomised tests.

14 Let $x_1, x_2, \ldots x_n$ be a random sample of size 'n' from an exponential population. Derive the best critical region for testing $H_0$: $\theta=\theta_0$ against $H_1$ : $\theta<\theta$, at $\alpha$% level of significance.

15 Explain large sample test procedure for testing difference of means.

16 Explain Fisher's Z-transformation for two population correlation coefficients.

17 Derive $\chi^2$ – test statistic in test for independence of attributes for a 2x2 contingences table.

18 Explain t-test procedure for (a) two independent samples and (b) sample correlation coefficient.

19 Explain in detail about sign test and signed rank test for two samples.

20 Explain about median test and Mann-Whitney U-test procedures with ties and large sample approximations.

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51

Code No. 7116

# FACULTY OF SCIENCE

**B.Sc. IV-Semester (CBCS) Examination, May / June 2018**

**Subject: Statistics**

**Paper – IV**

**Inference**

**Time: 3 Hours** **Max.Marks: 80**

## PART – A (5x4 = 20 Marks)
**[Short Answer Type]**

**Note: Answer any five of the following questions.**

1 Explain two types of error in testing of hypothesis.

2 Explain about non-randomized test.

3 Describe the large sample test procedure for difference of standard deviations.

4 Explain Fisher's Z-transformation for population correlation coefficient.

5 Explain the $\chi^2$ (Chi-square) test for goodness of Fit.

6 Explain about F-test for equality of population variances.

7 Discuss advantages and disadvantages of non-parametric tests.

8 Describe nominal, ordinal, interval and ratio scales.

## PART – B (4x15 = 60 Marks)
**[Essay Answer Type]**

**Note: Answer all questions from the following.**

9 a) State and prove Neyman's Pearson Lemma.

OR

b) Let P be the probability that a coin will fall head in a single toss in order to test $H_o$: $p = \frac{1}{2}$ against $H_1$:$p = \frac{3}{4}$. The coin is tossed 5 times and $H_o$ is rejected if more than 3 heads are obtained. Find the probability of Type I Error and power of the test.

10 a) i) Describe the test of significance of difference of proportions for large samples.

ii) Data on days to maturity were recorded in two varieties of a pulse crop. Determine whether two means are significantly different.

| | n | Mean | Variance |
|---|---|---|---|
| Variety A | 60 | 60 | 8.20 |
| Variety B | 65 | 65 | 11.13 |

OR

b) i) Define order statistics and state their distributions.

ii) Explain run test procedure and its purpose for two sample case.

..2

11 a) Describe the $\chi^2$-test for independence of attributes and $\chi^2$-test for specified variance.

OR

b) Explain:
   i) t – test for difference of means
   ii) t – test for specified mean.

12 a) i) Explain the Median Test procedure.
   ii) Describe test procedure for Wilcoxon-Mann-Whitney U test.

OR

b) i) Explain Wilcoxon – Signed Rank Test for paired samples.
   ii) Describe the test procedure for sign test.

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# PAPER-V

Code No. 6518

# FACULTY OF SCIENCE

## B.Sc. / B.A. V Semester (CBCS) Examination, March 2022

### Subject: Statistics
### Paper – V - A: Applied Statistics - I

Time: 3 Hours | Max. Marks: 80

## PART – A

**Note: Answer any eight questions.** (8 x 4 = 32 Marks)

1 Explain sampling errors.
2 Define parameter, sampling unit, sample frame and standard error.
3 Show that in SRSWOR, the probability of selecting a specified unit of the population at any given draw is equal to the probability selecting it at the first draw.
4 Find $Var(\bar{y}_{st})$ Under proportional allocation.
5 Write the Advantages and disadvantages of Stratified random sampling.
6 Explain the methods of drawing simple random sample
7 Explain the additive and multiplicative models.
8 Explain the Fitting of Gompertz curve.
9 Write the merits and demerits of Link relative method.
10 Distinguish between Assignable causes and chance causes.
11 Explain the importance of SQC in industry.
12 Explain the construction of U-chart.

## PART – B

**Note: Answer any four questions.** (4 x 12 = 48 Marks)

13 Explain the principal steps of a sample survey.

14 Distinguish between SRSWOR and SRSWR. Show that Sample mean square is an unbiased estimate of population mean square

15 Show that $Var(\bar{y}_{st})_{opt} \leq Var(\bar{y}_{st})_{prop} \leq Var(\bar{y}_{n})_{R}$.

16 Define systematic sampling. Obtain the sampling variance of the mean under systematic sampling and compare with variance under SRSWOR.

17 What is Time series? What are the components of Time series? Explain with examples.

18 Explain the fitting of Modified Exponential Curve by the method of three selected points.

19 Explain the construction of $\bar{X}$ and $R$ charts in detail and what purpose they serve.

20 Explain the construction of p chart for fixed sample size and varying sample sizes.

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Code No. D-6518/BL

# FACULTY OF SCIENCE

B.Sc. / B.A. (CBCS) V Semester (Backlog) Examination, June / July 2022

Subject: Statistics

Paper – V – A : Applied Statistics – I

Time: 3 Hours Max. Marks: 80

## PART – A

**Note: Answer any eight questions.** **(8 x 4 = 32 Marks)**

1. Distinguish between census survey and sample survey.
2. In SRSWOR, show that the Sample mean is an unbiased estimate of population mean?
3. Show that in SRSWOR, the probability of selecting a specified unit of the population at any given draw is equal to the probability selecting it at the first draw.
4. Find $Var\left(\bar{y}_{st}\right)$ under optimum allocation.
5. Write the advantages and disadvantages of systematic sampling.
6. Explain the methods of drawing simple random sample.
7. Explain the method of moving averages
8. Explain the Fitting of Gompertz curve.
9. Write the merits and demerits of Ratio to trend method
10. Distinguish between process control and product control.
11. Explain the importance of SQC in industry?
12. Write the applications of C – chart.

## PART – B

**Note: Answer all the questions.** **(4 x 12 = 48 Marks)**

13. (a) Explain the principal steps of a sample survey.

**(OR)**

(b) Distinguish between SRSWOR and SRSWR. Find the variance of sample mean under SRSWOR and compare with SRSWR.

14. (a) Explain the purpose of stratification in sample surveys. Show that it is minimum for fixed total size of the sample.

**(OR)**

(b) Compare the simple random sampling, stratified random sampling and systematic sampling methods when the population consists a linear trend.

15. (a) What do you understand by the seasonal variation in a time series? Explain the link relative method of computing the indices of seasonal variation.

**(OR)**

(b) Explain the fitting of Modified Exponential Curve by the method of three selected Points.

16. (a) Explain the construction of control charts in detail and what purpose they serve?

**(OR)**

(b) Explain the construction of np chart for fixed sample size and stabilized np chart for varying sample sizes.

* * *

SM

Code No. D-7717

# FACULTY OF SCIENCE

B.Sc. (CBCS) V Semester Examination, June / July 2022

Subject: Statistics

Paper – V : Sampling Theory, Time Series, Index Numbers and Demand Analysis

Time: 3 Hours

Max. Marks: 60

## PART – A

**Note: Answer any five questions.** (5 x 3 = 15 Marks)

1. Define Probability Sampling
2. Define SRS (i) with replacement (ii) without replacement
3. Show that in SRSWOR sample mean in as unbiased estimator of population mean.
4. Define Optimum Allocation
5. A Population Consists of N=nk units. Explain the procedure to Obtain a Systematic sample of Size n from this Population.
6. Explain the Procedure of determining trend by moving average method.
7. The Demand curve and the Supply curve of a Commodity are given by $d=19-3p-p^2$ and $S = 5P-1$. Find the equilibrium Price and Quantity exchanged.
8. Define Quantity Index number.

## PART – B

**Note: Answer all the questions.** (3 x 15 = 45 Marks)

9. (a) Discuss briefly the basic Principle Steps of a Sample Survey.

(OR)

(b) Show that in SRSWOR the sample mean square is an unbiased estimator of population mean square.

10. (a) Explain the Neyman allocation method in stratified random sampling.

(OR)

(b) Explain Ration to Trend method of Computing the Indices of seasonal variation. Also Give its merits and demerits.

11. (a) What is meant by a Demand Function? Discuss Pigou's Method of deriving Demand curves from Time Series data.

(OR)

(b) Explain the Mathematical Tests for an Ideal Index Number. Illustrate these w.r.t. Fisher's Ideal Index number.

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57 24-11-2021

Code No. 18192/BL

# FACULTY OF SCIENCE

**B. Sc. V - Semester (CBCS) Examination, November / December 2021**

**Subject: Statistics**

**Paper – V – (DSC) : Sampling Theory, Time Series, Index Numbers and Demand Analysis**

**Time: 2 Hours** **Max. Marks: 60**

## PART – A

**Note: Answer any four questions.** **(4 x 5 = 20 Marks)**

1 Write about the Principles of Sample Surveys.
2 Define simple random sampling procedure under with and without replacement situation.
3 Define optimum allocation procedure
4 Write about irregular components
5 Describe the procedure to find relative efficiency of systematic sampling over simple random sampling without replacement.
6 Explain about price elasticity of demand
7 Explain about Forward and Backward splicing.
8 Explain about unite test and circular test

## PART – B

**Note: Answer any two questions.** **(2 x 20 = 40 Marks)**

9 Describe advantages of sample surveys against census surveys.

10 In SRSWOR, show that sample mean square is an unbiased estimate of the population mean square.

11 Define Stratified random sampling procedure show that

(i) $E(\overline{y}_{st}) = \overline{Y}_N$ and (ii) $V(\overline{y}_{st}) = \dfrac{1}{N^2}\sum_{i=1}^{k}\dfrac{P_iS_i^2}{n_i}\left(\dfrac{1}{n_i}-\dfrac{1}{N_i}\right)$.

12 Describe Logistic Curve fitting and its properties.

13 Explain Pigou's method for estimating demand in time series data.

14 Define Fisher's ideal index number. Show that it satisfies Time reversal and Factor reversal tests.

58

31

Code No. 18192

# FACULTY OF SCIENCE

**B. Sc. V - Semester (CBCS) Examination, July 2021**

**Subject: Statistics**

**Paper: V (DSC): Sampling Theory, Time Series, Index Numbers and Demand Analysis**

**Time: 2 Hours** **Max. Marks: 60**

## PART – A

**Note: Answer any four questions.** **(4 x 5 = 20 Marks)**

1 Define parameter, statistic and standard error.
2 Explain what are called non-sampling errors and state their sources.
3 Describe stratified random sampling procedure with an example.
4 Define Time Series. Explain about additive and multiplicative models of time series.
5 Explain about cyclic variations.
6 Explain about price elasticity of supply.
7 Explain Time reversal and factor reversal tests.
8 Define chain base and fixed base indices and their interrelation.

## PART – B

**Note: Answer any two questions.** **(2 x 20 = 40 Marks)**

9 Explain about principle steps of sample surveys.
10 In SRSWOR show that variance of sample mean is given by

$$V(\bar{y}_n) = \frac{s^2}{n} \cdot \frac{N-n}{N}$$

11 Define systematic sampling procedure. If $\bar{y}_{sys}$ is the mean of systematic sampling, then show that

$$V(\bar{y}_{sys}) = \frac{N-1}{N} S^2 - \frac{(n-1)k}{N} S^2_{wsy}$$

Where

$$S^2 = \frac{1}{k(n-1)} \sum_{i2}^{k} \sum_{j=1}^{n} (y_{ij} - \bar{y})^2$$

12 Explain link relatives method to find seasonal indices along with merits and demerits.

13 Derive curve of concentration in demand analysis.

14 Define cost of living index number. Explain its ...

Code No. 8192

# FACULTY OF SCIENCE

B.Sc. V – Semester (CBCS) Examination, October / November 2020

Subject: Statistics (Sampling Theory, Time Series, Index Numbers and Demand Analysis)

Paper – V

Time: 2 Hours                                                                 Max.Marks: 60

## PART – A (4 x 5 = 20 Marks)

Note : Answer any four questions.

1 Define sample. What are its limitations?
2 What are mixed sampling methods?
3 What is a time series? Name its components.
4 Define systematic sampling procedure.
5 What is whole sale price index? Give an example.
6 Explain about demand and supply curves.
7 Explain factor reversal test.
8 Write about mixed models of time series.

## PART – B (2x20=40 Marks)

Note: Answer any two questions.

9 Give advantages of sampling over census.

10 In SRSWR show that sample mean is unbiased estimator of population mean and derive its variance.

11 Explain stratified random sampling procedure. Prove that $V(\bar{y}_{st})$ is minimum for fixed total sample size 'n' if $n_i \propto N_i S_i$.

12 Explain modified exponential curve and its fitting by partial sums method.

13 Explain Leontief's method for estimating demand curve, stating assumptions.

14 Explain various methods of weighted price indices.

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Code No. 8192

# FACULTY OF SCIENCE

## B.Sc. V – Semester (CBCS) Examination, November / December 2019

## Subject: Statistics

### Sampling Theory, Time Series, Index Numbers and Demand Analysis

### Paper – V

**Time: 3 Hours** **Max.Marks: 60**

### PART – A (5x3 = 15 Marks)
### (Short Answer Type)

**Note:** Answer any FIVE of the following questions. Each question carries 3 marks.

1. Write about principles of sampling
2. What is subjective sampling? Explain. Give an example.
3. Define stratified random sampling.
4. Explain about growth curves.
5. What are Index Numbers? State their uses.
6. Define the terms Demand, Supply and Price elasticity of demand.
7. Explain time reversal test.
8. Explain additive model of time series.

### PART – B (3x15 = 45 Marks)
### (Essay Answer Type)

**Note:** Answer all the following three questions. Each question carries 15 marks.

9. a) Where sampling and non-sampling errors. Write about sources of the same.

**OR**

b) In SRSWOR, show that sample mean square is an unbiased estimator for population mean square.

10. a) Define systematic sampling procedure. Prove that

$$V(\bar{y}_{sys}) \doteq \frac{k-1}{nk} S^2_{wst} [1 + (n-1) \rho_{wst}]$$

**OR**

b) Explain link relatives procedure for determination of seasonal indicies.

11. a) Explain Pigou's method for estimating demand function, stating assumptions. Also mention its limitations.

**OR**

b) Explain base shifting, forward and backward splicing procedures with examples.

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Code No. 3190

# FACULTY OF SCIENCE

B.Sc. V-Semester (CBCS) Examination, November / December 2018

Subject : Statistics

Paper – V (DSC) : Sampling Theory, Time Series, Index Numbers and Demand Analysis

Time : 3 Hours | Max. Marks: 60

## PART – A (3 x 5 = 15 Marks)
(Short Answer Type)

**Note : Answer any FIVE of the following questions.**

1 Define Sampling unit and sampling frame.
2 Explain probability sampling.
3 Explain about proportional allocation.
4 Explain about Random fluctuations in Time Series data.
5 Distinguish between Complementary and competitive commodities.
6 What is Giffen's paradox?
7 Explain chain base Index Numbers.
8 Explain the multiplicative and mixed model of a Time series data.

## PART – B (3 x 15 = 45 Marks)
(Essay Answer Type)

**Note: Answer ALL questions.**

9 (a) Distinguish between sampling and non sampling errors. Give the sources of Non sampling errors.

OR

(b) Define SRSWOR and SRSWR. Show that in SRSWOR the probability of selecting a specified unit of the population at any given draw is equal to the probability of selecting it at the first draw.

10 (a) What are the seasonal variations? Explain Ratio to Trend method of calculating seasonal variations. Also give its merits and demerits.

OR

(b) Define Cost function. With a cost function $C = a + \Sigma_h c_h n_h$ prove that the variance of the estimated mean $\bar{y}_{st}$ is minimum when $n_h$ is proportional to $N_h S_h / \sqrt{C_h}$ .

11 (a) Describe Leontief's method of estimating price elasticity of demand for time series data and its limitations.

OR

(b) What is meant by (i) Base shifting (ii) Deflating (iii) Splicing of Index Numbers? Explain and illustrate.

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# PAPER-VI

Code No. 18193/BL

# FACULTY OF SCIENCE

B. Sc. V - Semester (CBCS) Examination, November / December 2021

Subject: Statistics (Statistical Quality Control and Reliability)

Paper – VI – A : (DSE-2E)

Time: 2 Hours | Max. Marks: 60

## PART – A

**Note: Answer any four questions.** (4 x 5 = 20 Marks)

1 Explain Process Control and Product Control

2 Derive Stabilized Control Chart for nP Chart

3 Give applications of C-Chart

4 What is Quality? Explain what is meant by Quality of material and manpower

5 Define Process Capability Index

6 Describe Single Sampling Plan Procedure

7 Define AQL and LTPD

8 Define Parallel System. Give two examples

## PART – B

**Note: Answer any two questions.** (2 x 20 = 40 Marks)

9 Define Control Chart. Explain Statistical basis of Control Charts.

10 Derive Control limits for $\overline{X}$ and $\sigma$ charts.

11 Derive modified Control Charts.

12 Derive Control limits for C-Chart and U-Chart.

13 Write about different types of OC - Curves.

14 Show that if failure density is exponential its hazard rate is constant.

* * *

22

Code No. 18193

FACULTY OF SCIENCE

B. Sc. V - Semester (CBCS) Examination, July 2021

Subject: Statistics (Statistical Quality Control and Reliability)

Paper – VI – A (DSE – 1E)

Time: 2 Hours

Max. Marks: 60

PART – A

Note: Answer any four questions. (4 x 5 = 20 Marks)

1 Explain about causes of variation.
2 Explain stabilized P-chart.
3 What are Natural tolerance limits and specification limits.
4 Explain about quality of machinery and management.
5 Explain interpretation of C-chart.
6 Define Producers risk and consumer's risk.
7 Define hazard function and system Reliability.
8 Define series system. Give two examples.

PART – B

Note: Answer any two questions. (2 x 20 = 40 Marks)

9 What is quality? Give uses of SQC.

10 Derive control limits for $\overline{x}$ and R charts.

11 Derive modified control limits.

12 Derive control limits for number of defects and give applications of the same.

13 Describe parallel system. Derive its reliability under different cases.

14 Design single sampling plan for attributes with given specifications α, β, AQL and LTPD.

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Code No. 8193

# FACULTY OF SCIENCE

**B.Sc. V – Semester Examination, November 2020**

**Subject: Statistics**

**Statistical Quality Control and Reliability**

**Paper: VI – A (DSE E – 1)**

**Time: 2 Hours** **Max.Marks: 60**

**PART – A (4 x 5 = 20 Marks)**
**Note : Answer any four questions.**

1 What is Schewart Control Charts?
2 Write about dimensions of quality
3 Explain about process capability index
4 Write about interpretation of C-Chart
5 What are natural tolerance limits and specifications limits?
6 Define Producers Risk and Consumer's Risk
7 Explain the meaning and concept of reliability
8 List the advantages of reliability program.

**PART – B (2 x 20 = 40 Marks)**
**Note : Answer any two questions.**

9 Give the importance of statistical quality control in industry. What are the control charts for attributes?

10 Derive the control limits for 'p' chart when sample size is varying

11 Derive control limits for number of defects per unit. State its applications.

12 Derive modified control limits.

13 Explain designing of single sampling plan and construction of its OC and ASN functions.

14 In a survival test conducted on 100 cards boxes for their strength under impact loading:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. of impacts | 20 | 22 | 24 | 26 | 29 | 32 | 35 | 34 | 40 |
| No. of boxes failed | 7 | 10 | 15 | 14 | 15 | 13 | 13 | 8 | 5 |

Compute the failure density, failure rate and reliability.

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Code No. 3191

# FACULTY OF SCIENCE

B.Sc. V-Semester (CBCS) Examination, November / December 2018

Subject : Statistics (Statistical Quality Control and Reliability)

Paper – VI (A) (DSE E – I)

Time : 3 Hours Max. Marks: 60

## PART – A (5 x 3 = 15 Marks)
(Short Answer Type)

Note : Answer any FIVE of the following questions.

1 What is the importance of SQC in industry?
2 Give the statistical basis of control charts.
3 What is c-chart and how do you interpret it?
4 What is the process capability index?
5 Derive the reliability function in terms of hazard rate.
6 Explain the concept of memory less property.
7 What are Rectifying Inspection plans?
8 Describe a single sampling plan. Give its ASN and ATI.



## PART – B (3 x 15 = 45 Marks)
(Essay Answer Type)

Note: Answer ALL questions.

9 (a) What are control charts? How do you construct mean and range charts?

OR

(b) How do you construct control chart for number of defectives in cases of (i) fixed sample size and (ii) variable sample size.

10 (a) Construct c-chart for variable sample size to the following data and state whether the process is under statistical quality control.

| Lot No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample size | 110 | 125 | 115 | 115 | 125 | 145 | 140 | 120 | 155 | 145 |
| Number of defectives | 15 | 14 | 13 | 17 | 14 | 3 | 14 | 11 | 15 | 12 |

OR

(b) Define (i) Natural tolerance limits ; (ii) specification limits and (iii) Modified control charts.

11 (a) What is double sampling plan? Explain its OC curve.

OR

(b) Explain parallel and series configuration of a system. Also derive their system reliability.

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# PAPER-VII

Code No: D-6620

# FACULTY OF SCIENCE

B.A. / B. Sc. (CBCS) VI - Semester Examination, June / July 2022

Subject: STATISTICS

Paper – VI-A : Applied Statistics - II

Time: 3 Hours

Max. Marks: 80

## PART – A

**Note: Answer any eight questions.** (8 x 4 = 32 Marks)

1. Explain the concept of gauss mark off linear model.
2. Find the expectation of error sum of squares in two way classification.
3. Write the statistical analysis of CRD?
4. Explain replication and local control.
5. Write the ANOVA table of LSD.
6. Explain the concept of critical difference.
7. Explain the uses of vital statistics.
8. Explain Standardised death rates.
9. Explain the abridged Life table.
10. Explain the functions of NSSO.
11. Why Fisher's index is called Ideal? Explain
12. Explain Splicing.

## PART – B

**Note: Answer all the questions.** (4 x 12 = 48 Marks)

13. a) Explain the Analysis of Variance of Two Way classification.

(OR)

b) Find the Expectation of Treatment and Error sum of Squares in one-way Classification.

14. a) Find the Efficiency of RBD over CRD.

(OR)

b) How do you estimate the missing observation in LSD? Give its statistical Analysis.

15. a) Explain different types of Fertility rates.

(OR)

b) What is Complete Life Table? Describe Various Components of a Life Table.

16. a) Distinguish between fixed base and chain base index numbers .From the fixed base index numbers given below ,construct chain base index numbers.

| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|
| Fixed Base index | 94 | 98 | 102 | 95 | 98 | 100 |

(OR)

b) Define Cost of Living Index Numbers. Describe various methods of its computation Also give its uses.

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69

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Code No. 18314

FACULTY OF SCIENCE

B.Sc. VI Semester (CBCS) Examination, July 2021

Subject: Statistics (Design of Experiments, Vital Statistics, Official Statistics and Business Forecasting)

Paper: VII DSC

Time: 2 Hours | Max. Marks: 60

## PART – A

**Note: Answer any four questions.** (4 x 5 = 20 Marks)

1 State Gauss-Markov of theorem.
2 Define Completely Randomized Design. Write its merits and demerits.
3 Define Latin Square Design (LSD). Write 4x4 Latin square.
4 State the functions of CSO.
5 Discuss the role of forecasting in Business.
6 Write the assumptions and uses of life table.
7 Define Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR).
8 Define Crude Birth Rate. Write its merits and demerits.

## PART – B

**Note: Answer any two questions.** **(2 x 20 = 40 Marks)**

9 State the assumptions, explain the analysis of variance for One-way classified data.

10 Write the complete analysis of Randomized Block Design (RBD).

11 How can you estimate the missing observation (one) in LSD, then write is ANOVA?

12 What is NSSO? What are its functions and explain how NSSO helps the government of India in evaluating economic status from time to time?

13 Define and explain various measures of Mortality's Rates.

14 What is population growth measure? Explain different population growth measures.

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70

Code No. 8314

# FACULTY OF SCIENCE

B.Sc. VI-Semester (CBCS) Examination, September / October 2020

Subject : Statistics (Design of Experiments, Vital Statistics, Official Statistics and Business Forecasting)

Paper – VII DSC

Time : 2 Hours Max. Marks : 60

## PART – A

**Note: Answer any four questions.** **(4x5=20 Marks)**

1 Define Birth rate and Age specific birth rate.
2 Explain the advantages of Randomised blocked design (RBD).
3 State Cochran's theorem. Give its applications.
4 Write the formulae for one missing observation in Latin square design (LSD) and explain them.
5 Explain the assumptions in life Table.
6 Explain the steps in Forecasting.
7 Explain about Agricultural statistics in brief.
8 Define standardized death rates. Why do we need them?

## PART – B

**Note: Answer any two questions.** **(2x20=40 Marks)**

9 Explain analysis of ANOVA for two way classification and stating the assumptions.

10 Write in detail about principles of Experimentation.

11 Write a detailed notes on central statistical organization (CSO).

12 Estimate the missing value in a Randomized Blocked design (RBD) and state the differences in its analysis when compared to complete BRD.

13 Write a detailed notes on population growth and how it can be measured? Explain.

14 Define various fertility rates and give suitable examples.

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**Code No. 3321/BL**

# FACULTY OF SCIENCE

**B.Sc. VI-Semester (CBCS) (Instant) Examination, September / October 2019**

**Subject : Statistics**

**Paper – VII (DSC) : Design of Experiments, Vital Statistics, Official Statistics and Business Forecasting**

**Time : 3 Hours** **Max. Marks: 60**

## PART – A (5 x 3 = 15 Marks)
**(Short Answer Type)**
**Note : Answer any FIVE of the following questions.**

1 Assumptions for ANOVA Test.
2 Statement of Cochran's Theorem.
3 Write any two applications of Designs of experiments.
4 Uses of National Income
5 Sources of vital statistics
6 Pearl's vital Index
7 Functions of CSO
8 Role of forecasting in Business

## PART – B (3 x 15 = 45 Marks)
**(Essay Answer Type)**
**Note: Answer ALL from the questions.**

9 (a) What are the principles of Designs of experiments? Explain them in detail.

OR

(b) State the mathematical model used in Analysis of variance in a two-way classification, hence obtain the expectations of various sum of squares two-way classification.

10 (a) How is the efficiency of a Design measured? Derive the expressions to measure efficiency of LSD over RBD when (i) Rows are taken as blocks (ii) columns are taken as blocks.

OR

(b) What is business forecasting? Describe the techniques of forecasting that are commonly employed by big business houses.

11 (a) Explain various columns of a life table and explain how a life table can be constructed from data usually available. Mention the uses of Life tables.

OR

(b) Explain crude and standardized death rates. Describe the direct and indirect method of finding standardized Death rates.

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# PAPER-VIII

Code No: D-6622

# FACULTY OF SCIENCE

B.A. / B. Sc. (CBCS) VI - Semester (Regular) Examination, June - August 2022

Subject: Statistics

Paper - Optional - Operation Research

Time: 3 Hours Max. Marks: 80

## PART – A

Note: Answer any eight questions. (8 x 4 = 32 Marks)

1. Define Slack and Surplus Variable.
2. Define standard form of LLP.
3. Define general linear programing problem.
4. Define Artificial Variable.
5. What are the advantages of Duality?
6. Write the Dual of a following LLP.
   Max $Z = 2x_1 + 3x_2$
   Subject to the constrains
   $5x_1 + 2x_2 \leq 40, 6x_1 + 12x_2 \leq 80$ and $x_1 \geq 0, x_2 \geq 0$
7. Define Degeneracy in Transportation Problem.
8. Explain Transhipment problem.
9. Explain least cost method In Transportation Problem.
10. Explain Travelling salesman problem.
11. Explain Unbalanced Assignment Problem.
12. Write the formula for i) Total Elapsed Time ii) Idle Time for Two Machines.

## PART – B

**Note: Answer all the questions. (4 x 12 = 48 Marks)**

13. (a) Explain Graphical method to solve the LLP.

(OR)

(b) Solve the LLP by Simplex Method.
Max$z = 5x_1 + 3x_2$
subject to the constrains
$3x_1 + 5x_2 \leq 15$; $5x_1 + 2x_2 \leq 10$; and $x_1, x_2 \geq 0$.

14. (a) Solve the LPP By Big M Method
Min$z = 2x_1 + x_2$
Subject to constrains.
$3x_1 + x_2 = 3$; $4x_1 + 3x_2 \geq 6$; $x_1 + 2x_2 \leq 3$; and $x_1, x_2 \geq 0$.

(OR)

(b) Explain Two-Phase Method Algorithm to solve the LLP.

15. (a) Explain Stepping stone Method to solve the Transportation problem.

(OR)

(b) Solve the following Transportation Problem using MODI Method

| TO | | $D_1$ | $D_2$ | $D_3$ | $D_4$ | SUPPLY |
|---|---|---|---|---|---|---|
| FORM | $O_1$ | 7 | 3 | 8 | 6 | 60 |
| | $O_2$ | 4 | 2 | 5 | 10 | 100 |
| | $O_3$ | 2 | 6 | 5 | 1 | 40 |
| DEMAND | | 20 | 50 | 50 | 80 | 200 |

16. (a) Explain The Hungarian Method Algorithm to solve the Assignment Problem.

(OR)

(b) Find the Sequence that Minimizes the Total Elapsed Time required to complete the 7 jobs on 3 Machines in the Order ABC

| Job | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Machine A | 3 | 8 | 7 | 4 | 9 | 8 | 7 |
| Machine B | 4 | 3 | 2 | 5 | 1 | 4 | 3 |
| Machine C | 6 | 7 | 5 | 11 | 5 | 6 | 12 |

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Code No. D-7818

# FACULTY OF SCIENCE

B.A / B.Sc. (CBCS) VI - Semester Examination, June / July 2022

Subject: Statistics (Operation Research)
Paper-VIII-(A) - DSE - E-I

Time: 3 Hours Max. Marks: 60

## PART – A

**Note: Answer any five questions.** (5 x 3 = 15 Marks)

1. Define Convex Set.
2. Define Canonical Form of LLP.
3. Define Dual of LLP.
4. Define Unbalanced Transportation Problem.
5. Explain Travelling Salesman Problem.
6. Explain Sequencing Problem.
7. Explain Matrix Minima method.
8. Define Assignment Problem.

## PART – B

**Note: Answer all the questions.** (3 x 15 = 45 Marks)

9. (a) Explain meaning and scope of OR.

(OR)

(b) Explain the Simplex Algorithm to Solve the LLP.

10. (a) Explain Dual and Primal Relationship.

(OR)

(b) Explain the MODI Algorithm to solve the Transportation Problem.

11. (a) Find Minimum Assignment schedule from the following Cost Matrix.

PERSONS

| | | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| JOBS | A | 5 | 7 | 11 | 6 |
| | B | 8 | 5 | 9 | 5 |
| | C | 4 | 7 | 10 | 7 |
| | D | 10 | 4 | 8 | 3 |

(OR)

(b) Explain the procedure to solve a Sequencing problem with n Jobs through 2 machines.

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Code No. 18315/BL

# FACULTY OF SCIENCE

## B.Sc. VI Semester (CBCS) Examination, November / December 2021

### Subject: Statistics (Operations Research)
### Paper: VIII-A (DSE E-I)

Time: 2 Hours                                                                Max. Marks: 60

## PART – A

Note: Answer any four questions.                                        (4 x 5 = 20 Marks)

1 Define standard form of LPP.
2 Explain the importance of artificial variables in solving LPP.
3 What is unbalanced transportation problem and how do you resolve it?
4 State Fundamental theorem of duality and also define primal and dual problems.
5 Explain the travelling salesman problem.
6 Define job sequencing and also give its assumptions.
7 Define total elapsed time, idle time, processing time.
8 Explain about the formulation of transportation problem.

## PART – B

Note: Answer any two questions.                                        (2 x 20 = 40 Marks)

9 Explain the graphical method of solving LPP.

10 Solve the following LPP using penalty method.

$$Max \quad Z = 5x_1 + 3x_2$$

$$Sub: \quad 2x_1 + x_2 \leq 1$$

$$x_1 + 4x_2 \geq 6$$

$$\text{and} \quad x_1,\ x_2 \geq 0$$

11 Explain the stepping stone method of solving transportation problem.

12 Define transportation problem and also explain the methods of finding initial basic feasible solution to TP.

13 Explain the formulation of Assignment problem and also the procedure of solving the assignment problem.

14 Find the optimum sequence of the following jobs on three machines and also compute the total elapsed time.

| Jobs / Machines | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| $M_1$ | 4 | 9 | 8 | 6 | 5 |
| $M_2$ | 5 | 6 | 2 | 3 | 4 |
| $M_3$ | 8 | 10 | 6 | 7 | 11 |

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77

29/07/21

Code No. 18315

FACULTY OF SCIENCE
B.Sc. VI Semester (CBCS) Examination, July/August 2021

Subject: Statistics (Operation Research)
Paper: VIII-A (DSE E-I)

Time: 2 Hours                                                                 Max. Marks: 60

## PART – A

(4 x 5 = 20 Marks)

**Note: Answer any four questions.**

1 Define Slack and Surplus Variable.
2 Define convex set and write any 3 of its properties.
3 Explain the concept of Duality.
4 Define Degeneracy in Transportation problem.
5 Explain Unbalanced Assignment Problem.
6 Explain the concept of Transhipment problem.
7 Explain North-West Corner Method.
8 Define General Linear Programming Problem.

## PART – B

(2 x 20 = 40 Marks)

**Note: Answer any two questions.**

9 Write the step by step procedure of solving LPP by simplex method.

10 Explain the Big-M method Algorithm to solve the LLP.

11 Explain Dual and Primal Relationship. And also explain how the solution to dual problem can be obtained when primal problem is solved.

12 Find the IBFS to the following transportation problem using
(i) Matrix Minima Method (ii) VAM

| TO | | D1 | D2 | D3 | D4 | SUPPLY |
|---|---|---|---|---|---|---|
| FORM | $O_1$ | 7 | 3 | 8 | 6 | 60 |
| | $O_2$ | 4 | 2 | 5 | 10 | 100 |
| | $O_3$ | 2 | 6 | 5 | 1 | 40 |
| DEMAND | | 20 | 50 | 50 | 80 | 200 |

13 Explain assignment problem and write the Hungarian Method Algorithm to solve the assignment problem.

14 Find the Sequence that Minimizes the total Elapsed Time required to complete the 7 jobs on 3 machines in the order ABC

| Job | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Machine A | 3 | 8 | 7 | 4 | 9 | 8 | 7 |
| Machine B | 4 | 3 | 2 | 5 | 1 | 4 | 3 |
| Machine C | 6 | 7 | 5 | 11 | 5 | 6 | 12 |

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78

Code No. 8315

# FACULTY OF SCIENCE

B.Sc. VI-Semester (CBCS) Examination, September / October 2020

Subject : Statistics (Operation Research)
Paper – VIII-A (DSE E-I)

Time : 2 Hours Max. Marks: 60

## PART – A

**Note : Answer any four questions.** (4x5=20 Marks)

1 What is degeneracy in LPP?
2 When are artificial variable used?
3 Describe the transportation problem.
4 Define: a) basic feasible solution b) Optimum Solution
5 Define Sequencing Problem.
6 Express Assignment problem is a special case of LPP.
7 Define Slack and Surplus variable.
8 What is unbalanced TP? How it is balanced?

## PART – B

**Note : Answer any two questions.** (2x20=40 Marks)

9 Explain the procedure to solve LPP using Two Phase method.

10 A factory makes two products A and B giving profits of Rs. 5 and Rs. 4 per unit resp. These products are manufactured on two machines M and N. Product A requires one minute of processing on M and two minutes of N. Product B requires 1.5 each minutes each on M and N resp. The machines M and N are available for 400 min and 600 min resp. Formulate it as LPP to maximize the profit and find the optimum solution by graphical method.

11 Explain the concept of duality and Dual – Primal relationships.

12 Explain the step wise procedure of Matrix Minima Method and VAM for a TP.

13 Write Hungarian Algorithm for obtaining minimum cost to Assignment problem.

14 Explain the procedure to solve a sequencing problem with 'n' jobs and 3 machines.

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# PAPER-I

80

Code No: 9522

# FACULTY OF ARTS & SCIENCE

**B.A. / B.Sc I - Year (Backlog/Suppl.) Examination, December 2020**

**Subject: Statistics (Theory)**

**Paper – I – Descriptive Statistics and Probability Distributions.**

**Time: 2 hours** **Max. Marks: 100**

**Note: Answer any four questions by choosing any two bits from I-V units. All questions carry equal marks. Scientific calculators are allowed.**

**PART-A (4 x 25 = 100 Marks)**

I. (1) Explain about Mean, Median and Mode with merits and demerits.

(2) Define central and non-central moments. Derive the expressions to express central moments in terms of non-central moments.

(3) Define conditional distribution. State and prove multiplication theorem of probability for 'n' events.

(4) state and prove Boole's inequality.

II. (5) Define distribution function, state and prove its properties.

(6) The joint probability density function of a two-dimensional random variable (x,y) is given by

$$f(x,y) = \begin{cases} ax^3y^3 & ; 0 \le x, y \le 2 \\ 0 & ; \text{otherwise} \end{cases}$$

Find the value of 'a', marginal densities of x and y.

(7) Explain one dimensional transformation of random variables. If x and y are two independent random variables with probability density functions $f(x) = e^{-x}; x > 0$ and $f(y) = 3e^{-3y}; y > 0$. Find the probability distribution of Z = x/y.

(8) Define Mathematical expectation. State the properties of expectations.

III. (9) Define Binomial distribution. Derive its mean and variance.

(10) Define Geometric distribution. State and prove its memoryless property.

(11) Define poisson distribution. Derive its probability mass function.

(12) Define Bernoulli distribution. Derive Binomial distribution probability mass function.

IV. (13) In normal distribution show that Q.D:M.D:S.D.:: 10:12:15.

(14) Derive normal distribution probability density function.

(15) Define Beta distribution of first kind. Derive its mean and variance.

(16) Define Exponential distribution. If $x_1, x_2, \ldots, x_n$ are independent random variables from Exponential distribution with parameters θ; ; 1, 2, ....., n, then show that $z = \min(x_1, x_2, \ldots, x_n)$ has exponential distribution with parameter

$$\theta = \sum_{i=1}^{n} \theta_i \, .$$

V. Write short note on any two of the following.

(17) Sheppard's corrections.

(18) Definitions of Probabilities

(19) Chebychev's inequality and its applications

(20) Discrete uniform distribution.

(21) Cauchy distribution.

* * *

Code No. 4022 / BL

# FACULTIES OF ARTS AND SCIENCE

**B.A / B.Sc. I Year (Backlog) Examination, March / April 2019**

**Subject: Statistics**

**Paper – I**

**Descriptive Statistics and Probability Distribution**

**Time: 3 Hours** **Max. Marks: 100**

**Note: Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculations are allowed.**

I 1 Define central and non-central moments. In a certain distribution the first four moments about the point 4 are -1.5, 17, -30 and 108 respectively. Find the Kurtosis of the frequency curve and comment on its shape.

2 What is meant by skewness? Explain various measures of coefficient of skewness.

3 State and prove Baye's theorem.

4 a) Define independence, pair-wise independence and mutual independence of events.

b) State and prove multiplication theorem of probability for 'n' events.

II 5 Define continuous random variable and probability density function. If 'X' has its probability density function as:

$$f(x) = ax,\ 0 \le x \le 1$$
$$= a,\ 1 \le x \le 2$$
$$= 3a - ax,\ 2 \le x \le 3$$
$$= 0, \text{ otherwise}$$

Determine the constant 'a' and compute $P(0.5 \le x \le 2.5)$

6 Define mathematical expectation of a random variable 'X'. Find $E[X]$, $E[X^2]$, $E[X^3]$ and $V[X]$ from the data given below:

| X: | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| $P_i$: | 0.10 | 0.15 | 0.20 | 0.25 | 0.18 | 0.12 |

7 State and prove Cauchy-Schwartz's inequality.

8 Define MGF and CGF of a random variable X. What is the effect of change of origin and scale on them?

III 9 Define Binomial distribution. Obtain its MGF and hence find mean and variance.

10 Define Hyper geometric distribution, stating the condition show that hyper geometric distribution tends to Binomial.

11 Define Geometric distribution. State and prove its lack of memory property.

12 Derive recurrence relation for the moments of Negative Binomial distribution.

..2

IV 13 Define rectangular distribution over an interval [-a, a] obtain its m.g.f and hence find its mean and variance.

14 Show that for normal distribution QD:MD:SD::10:12:15.

15 Derive distribution function and moment generating function of an exponential random variable with parameter '$\theta$'.

16 Obtain mean and variance of Beta distribution of first kind.

V Answer any three of the following:

17 Sheppard's correction for moments

18 Boole's Inequality

19 One dimensional transformation of random variables

20 Gamma distribution

21 Distribution function and its properties.

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83

# FACULTIES OF ARTS AND SCIENCE

**B.A. / B.Sc. I – Year (Backlog) Examination, October / November 2018**

**Subject : STATISTICS (Theory)**

**Paper – I**

**Descriptive Statistics and Probability Distributions**

**Time : 3 hours** **Max. Marks : 10**

***Note : Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.***

I 1 Explain the methods of Primary data and Secondary data collection. Draw up a blank table showing the distribution of population in district A, according to the five age groups from 0 to 100 years. Sex, literacy and civil conditions.

2 a) The first four moments of a distribution about origin are 1, 4, 10 and 46 respectively. Obtain coefficient of skewness and kurtosis.
b) Show that Bowley's coefficient of skewness lies between -1 and +1.

3 a) Define Independence, Pair wise Independence and mutually independence of events.
b) State and prove additional theorem of probability for 'n' events.

4 State and prove Baye's theorem. Suppose 5 men out of 100 and 25 women out of 1000 are colour blind. A colour blind person is chosen at random. What is the probability of his being male? (Assume males and females to be equal in numbers.

II 5 Define continuous random variable and probability density function. If x has its probability density function as :

$F(x) = ax,\ 0 \le x \le 1$
$= a,\ 1 \le x \le 2$
$= 3a\text{-}ax,\ 2 \le x \le 3$
$= 0$, otherwise

Determine the constant 'a' and compute $P(0.5 \le x \le 2.5)$

6 Define mathematical expectation of a random variable, raw and central moments using mathematical expectation.
Find E(X), $E(X^2)$ and V(X) from the data given below

| | | | | | | |
|---|---|---|---|---|---|---|
| X : | 1 | 2 | 3 | 4 | 5 | 6 |
| $P_i$ : | 0.10 | 0.15 | 0.20 | 0.25 | 0.18 | 0.12 |

7 Define moment generating function of a random variable. Prove that the moment generating function of the sum of independent random variable is equal to the product of their moment generating functions.

8 State and prove multiplication theorem on mathematical expectations for two continuous random variables.

III 9 Define binomial variate with parameter n and p and obtain its probability function. The odds in favour of X winning a game against Y are 4 : 3. Find the probability of Y's, winning 3 game out of 7 played.

10 Define Hyper Geometric distribution. Stating the condition show that Hyper Geometric distribution tends to Binomial distribution.

11 Obtain the recurrence relation between the moments of Poisson distribution. Hence obtain the coefficient of skewness and kurtosis of Poisson distribution.

12 Derive moments generating function of negative binomial distribution and hence show that its mean < variance.

IV 13 Define rectangular distribution over an interval [-a, a]. Obtain its m.g.f. and hence or otherwise find its mean and variance.

14 Show that for normal distribution QD:MD:SD::10:12:15.

15 Derive distribution function and moment generating function of an exponential random variable with parameter '$\theta$'.

16 Obtain mean and variance of beta distribution of first kind.

V Answer any **three** of the following :

17 Sheppard's correction for moments

18 Boole's inequality

19 Importance of Cauchy distribution in statistics

20 Chebyshev's inequality

21 Distribution function and its properties

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Code No. 2025 / S

# FACULTIES OF ARTS AND SCIENCE

B.A. / B.Sc. I – Year Examination, October / November 2016

Subject : STATISTICS (Theory)

Paper – I

Descriptive Statistics and Probability Distributions

Time : 3 hours Max. Marks : 100

*Note : Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.*



I 1 a) What is tabulation? Explain various parts of a table in detail.

b) The mean and standard deviation of 20 items is found to be 10 and 2 respectively. At the time of checking it was found that one of the value was wrongly copied as 8 instead of 12. Calculate the correct mean and standard deviation.

2 a) The first four moments of a distribution about origin are 1, 4, 10 and 46 respectively. Obtain coefficient of skewness and kurtosis.

b) Show that Bowley's coefficient of skewness lies between -1 and +1.

3 State and prove Addition theorem of probability for n events.

4 a) For n events $E_1, E_2, \ldots E_n$, prove that $P\left(\bigcap_{i=1}^{n} E_i\right) \geq \sum_{i=1}^{n} P(E_i) - (n-1)$ .

b) A bag contains 50 tickets numbered 1, 2 ........50. Five tickets are drawn at random and arranged in an ascending order of magnitude. What is the probability that the third ticket is 30.

II 5 a) Define distribution function of a random variable and state its properties.

b) A D.T.P. operator's profit (X) per page is a random variable with the pdf

$$f(x) = \begin{cases} \frac{1}{8}(x+1), & -1 < x < 5 \\ 0, & \text{elsewhere} \end{cases}$$

Where the units are in rupees. Find the expected value and variance of the profit.

6 a) Write the procedure for transformation of one-dimensional random variable.

b) The join pdf of two-dimensional random variable (X, Y) is given by

$$f(x) = \begin{cases} kx^2y, & 0 < x < 1;\ 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

i) Find the value of k ii) Find the marginal densities of x and y.

7 Define MGF and CGF of a random variable. Establish the relations between moments and cumulants.

8 a) State and prove Chebyshev's inequality.

b) A random variable X has mean 24 and variance 9. Obtain a bound on the probability that the random variable X assumes values between 16.5 to 31.5.

III 9 a) Define Binomial distribution. Derive its MGF.

b) The probability of newly generated virus will attack the computer system and corrupt the file opened is 1/5. If 12 files are opened, find probability that i) atleat 10 files will be corrupted by the virus ii) all the files will be safe.

10 Obtain the cumulant generating function of Poisson distribution with parameter λ. Hence show that for a Poisson distribution with parameter λ all the cumulants are equal to λ.

11 Define Hyper Geometric distribution. Find its mean and variance.

12 Prove that Poisson distribution is the limiting case of Negative Binomial distribution by stating the conditions.

IV 13 Define Uniform distribution over (a, b). The mean and variance of a uniform variate X is 1 and 4/3 respectively. Find the median and third central moment.

14 Show that for a Normal Distribution QD : MD : SD : : 10 : 12: 15.

15 i) Obtain the MGF of exponential distribution. Find its mean and variance.

ii) The length of time for the individual to be served in a cafeteria is a random variable having exponential distribution with mean of 4 minutes. What is the probability that a person is served in less than 3 minutes.

16 Define Beta distribution of First kind. Find its mean and variance.

V Write short notes on any **three** of the following :

17 Difference between Questionnaire and schedule

18 Baye's theorem

19 Cauchy – Schwartz's inequality

20 Lack of memory property of Geometric distribution

21 Limiting case of Gamma distribution

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4

87

# KESHAV MEMORIAL INSTITUTE OF COMMERCE AND SCIENCES

NARAYANAGUDA, HYD-29

B.Sc I Year (PRE-FINAL EXAMINITION,March -2015)

Subject: Statistics (Paper-I)

(Descriptive statistics and probability distribution)

Time : 3 Hrs max:1

Note: Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks
Scientific calculators are allowed.

I

1.Distinguish between a questionnaire and a schedule. and primary and secondary data

2.(a).Write about Sheppard's corrections and central moments of grouped data.
(b) The sum and sum of squares corresponding to length X(in cms) and weight Y(in kgs) of 50 tapioca tubes are given as $\sum X=212$; $\sum X^2=902.8$; $\sum Y=261$;$\sum Y^2=1457.6$.Which is more varying ,the lengty or weight.

3.state and prove Booles inequality.

II

4.state and prove Bayes thorem.

5.(a).Define discrete and continuous random variable (b).Define p.m.f and p.d.f

6.State and prove Cauchy Schwartz's inequality.Give its applications .

7.Define M.G.F of r.v and state and prove its properties .

8 .Define mathematical expectations of a r.v's. Derive the raw and central moments and the Covariance of the same using mathematical expectation.

III

9.Define Binomial distribution .Derive its MGF and hence the first four moments.

10.Derive poissson distribution as a limiting form of binomial distribution ,by stating the conditions clearly.

11. Derive the mean and variance of the Hypergeometric disribution.

12.Obtain m.g.f and c.g.f of negative binomial distribution .Hence find its mean and variance.

IV

13.Definre Gamma distribution and derive its M.G.F.Hence find the mean and variance

14.State and prove the lack of memory less property of exponential distribution.

15.Define Beta d.b of the 2[nd] kind. Find its mean and variance .

16.Define Normal distribution .Derive mode and Median of Normal d.b's.

V Write short note on any 3 of the following.

17. Skewness
18.Bernoulli Distribution .
19.Addition theorem of probability for "2" events.
18.Chebychev's inequality.
20.Measures of central tendency.

Code No. 1525 / E

# FACULTIES OF ARTS AND SCIENCE

## B.A. / B.Sc. I Year (Regular) Examination, March / April 2014

### Subject: Statistics (Theory)
### Paper – I: Descriptive Statistics and Probability Distributions

Time: 3 Hours

Max.Marks: 100

**Note:** Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.

I

1 (a) Distinguish between a questionnaire and a schedule.
(b) Means of two distributions of 100 and 150 items are 50, 40 respectively. Find the combined mean.

2 Explain with suitable examples the term 'Dispersion'. How is it measured? Explain the superiority of standard deviation over other measures of dispersion.

3 State and prove multiplication theorem of probability for 'n' events.

4 State and prove Baye's theorem. Suppose 5 men out of 100 and 25 women out of 1000 are colour blind. A colour blind person is chosen at random. What is the probability of his being male? (Assume that a person being male or female is equally probable).

II

5 Define continuous random variable and probability density function. If 'X' has its probability density function as

$$f(x) = \begin{cases} ax; & 0 \le x \le 1 \\ a; & 1 \le x \le 2 \\ 3a - ax; & 2 \le x \le 3 \\ 0; & \text{Otherwise} \end{cases}$$

Determine the constant 'a' and compute the $P(0.5 \le x \le 2.5)$.

6 Define probability generating function (p.g.f) of a random variable X. Obtain the expressions for mean and variance in terms of p.g.f.

7 State and prove Cauchy-Schwartz's inequality.

8 A two dimensional r.v. (x,y) have a bivariate distribution given by

$$P(x=x;\ y=y) = \frac{x^2+y}{32} \text{ for } x = 0, 1, 2 \text{ and } y = 0, 1.$$ Find the marginal distributions of x & y.

III

9 Obtain the moment generating function of binomial distribution. Hence show that the sum of two binomial variates is a binomial variate, if the variates are independent and have the same probability of success.

10 Derive poisson distribution as a limiting form of binomial distribution, by stating the conditions clearly.

11 (a) What is a hypergeometric distribution?
(b) Obtain mean and variance of a hypergeometric distribution.

12 Obtain m.g.f. and c.g.f. of negative binomial distribution. Hence find its mean and variance.

IV

13 Define gamma distribution and derive its MGF. Hence find the mean and variance.

14 State and prove the lack of memory less property of exponential distribution.

15 Let $X \sim N(\mu, \sigma^2)$, then show that 'X' has a symmetric distribution.

16 Define beta distribution of first and second kind. State the relationship between them.

V Write short notes on any THREE of the following:

17 Addition theorem of probability for '2' events.

18 Central limit theorem.

19 Reproductive property of Poisson distribution.

20 Measures of central tendency.

21 Even order moments of normal distribution.

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Code No. 5555 / ET / S

FACULTIES OF ARTS & SCIENCE

B.A. / B.Sc. I Year (Regular) Examination, October / November 2013

Subject: Statistics

Paper – I

Descriptive Statistics and Probability Distributions

Time: 3 Hours Max.Marks: 100

**Note: Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.**

I. 1. Distinguish primary and secondary data. Write in detail designing of a questionnaire.

2.(a) Write about Sheppard's Corrections for central moments of grouped data.

(b) The sum and sum of squares corresponding to length X(in cms) and weight Y (in kgs) of 50 tapioca tubers are given as $\sum X = 212$; $\sum X^2 = 902.8$; $\sum Y = 261$, $\sum Y^2 = 1457.6$. Which is more varying, the length or weight?

3.(a) State and prove Boole's inequality.

(b) Let A and B be two events associated with a random experiment and S be the sample space. If C is an event such that $P(C) \neq 0$, then prove that, $P((A \cup B) / C) = P(A/C) + P(B/C) - P((A \cap B) / C)$.

4. Define pair-wise independent and mutually independent events. Let A, B and C denote respectively, the events that a book is favourably reviewed by three critics X, Y and Z. If $P(A) = \frac{2}{5}$, $P(B) = \frac{5}{7}$ and $P(C) = \frac{3}{5}$, then what is the probability that (i) all the three reviews will be favourable and (ii) majority will reviews will be favourable.

II. 5. Define distribution function of a random variable X. State and prove its properties.

6.(a) Define marginal and conditional distribution for bivariate r.v.s.

(b) If X and Y are two r.v. having joint density function,

$f(x,y) = (1/8)(6-x-y)$; $0 \leq x < 2$, $2 \leq y < 4$

$= 0$, otherwise, find $P((X+Y) < 3)$.

7. Define Mathematical Expectation of a random variables. Derive the raw and central moments and the covariance of the same using mathematical expectation.

8. Define MGF and CGF of a random variable. Write the statements of their properties.

III. 9. Define binomial distribution. Derive its MGF and hence the first four moments.

10. Derive the mean and variance of the Hypergeometric distribution.

11. Define Poisson distribution and derive its mode.

12. A couple decides to have children until they have a male child. What is probability distribution of children they would have? If the probability of male child in their community is 2/5, how many children they are expected to have before first male child is born?

IV. 13. For a Normal Distribution, prove that QD : MD : SD :: 10 : 12 : 15.

14. The pdf of a r.v.x is given by $f(x) = 1/(2a)$ $-a \leq x \leq a$.

$= 0$ otherwise

Find the first four central moments, $\beta_1$, and $\beta_2$ of this distribution.

15. Define Beta Distribution of the 2[nd] kind. Find its mean and variance.

16. Define Exponential Distribution. Prove its memory-less property.

V. **Write short note on any three of the following:**

17. Skewness
18. Bernoulli Distribution
19. Rectangular Distribution
20. Chebychev's inequality
21. Central Limit Theorem.

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Total Printed Pages : 4

Code No. 8057/ET/S

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90

# FACULTIES OF ARTS & SCIENCE

## B.A./B.Sc. I Year Examination, October/November 2012

### Subject : STATISTICS (Regular)

### Paper : I (Descriptive Statistics & Probability Distributions)

Time : 3 Hours ]

[ Max. Marks : 100

Note : Answer all questions. Answer question I to IV choosing any two from each unit and any three from question V. All questions carry equal marks. Scientific calculators are allowed.

I. 1. Explain the methods of collecting Primary data with advantages and disadvantages.

2. Define Central and Non Central moments. In certain distribution the first four moments about the point 5 are $-4, 22, -117$ and 560 respectively. Find the $\beta$ and $\gamma$ coefficients.

3. State and prove addition theorem of probability for 'n' events.

4. (a) If A, B and C are mutually independent events then show that $A \cup B$ and C are also independent.

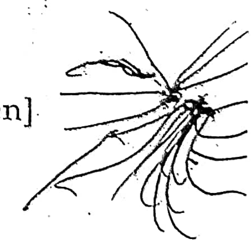
(b) Define conditional probability. If the letters of the "MISSISSIPPI" are arranged at random, what is the probability that (i) all S's are not together and (ii) all I's are together.

II. 5. (a) Define discrete random variable and probability mass function.

(b) The following is the distribution function of a discrete random Variable X

| $x$ : | $-3$ | $-1$ | 0 | 1 | 2 | 3 | 5 | 8 |
|---|---|---|---|---|---|---|---|---|
| $F(x)$ : | 0.10 | 0.30 | 0.45 | 0.5 | 0.75 | 0.90 | 0.95 | 1.00 |

(i) Find the probability distribution of X (ii) Find P [X is even] (iii) $P[1 \le X \le 8]$.



6. The random variable x and y have the joint density function

$f(x,y) = 2 \,;\, 0 < X < 1 \,;\, 0 < Y < x.$

$= 0 \,;$ otherwise

(a) Find marginal density functions of X and Y.

(b) Find conditional density function of Y given $X = x$ and conditional density function of X given $Y = y$.

(c) Check for independence of X and Y.

Contd...2

7. Define moment generating function of a random variable and state and prove its properties.

8. State and prove Cauchy-Schwartz inequality. Give its applications.

III. 9. Define Binomial distribution. Obtain its MGF and hence find mean and variance.

10. (a) Show Poisson distribution as a limiting case of the Negative Binomial distribution.

(b) Show mean < variance in Negative Binomial distribution.

11. Define Geometric distribution. State and prove its lack of memory property.

12. Define Hyper geometric distribution. Obtain its Mean and Variance.

IV. 13. Define Normal Distribution. Derive mode and median of Normal distributions.

14. Define exponential distribution. Derive expression for its distribution functions. Show that it lacks memory.

15. Define Gamma distribution with two parameters. State and prove its additive property.

16. Define Beta distribution of second kind. Find its mean and variance.

V. Write short note on **any three** of the following.

17. Kurtosis

18. Independence of events.

19. One dimensional transformation of random variables.

20. Bernoulli distribution.

21. Cauchy distribution

## TELUGU VERSION

సూచన : అన్ని ప్రశ్నలకు సమాధానములు వ్రాయుము. ప్రశ్నలు I నుండి IV వరకు ఏవేని రెండింటికి మరియు V లో ఏవేని **మూడింటికి** సమాధానములివ్వుము. సైంటిఫిక్ కాలిక్యులేటర్లు అనుమతింపబడును.

I. 1. ప్రాథమిక దత్తాంశమును సేకరించు పద్ధతులను వాని లాభనష్టములతో సహా వివరింపుము.

2. కేంద్రీయ మరియు అకేంద్రీయ ఘాతీకలను నిర్వచించుము. ఒక విభాజనములో బిందువు 5 నుండి గణింపబడిన మొదటి నాల్గు [illegible] ఘాతీకలు వరుస్సగా −4, 22, 117 మరియు 560 అయినప్పుడు β మరియు γ గుణకములను కనుగొనుము.

Contd...3

92

# KESHAV MEMORIAL INSTITUTES OF COMMERCE AND SCIENCES

NARAYANAGUDA,HYD-29

PRE- FINAL EXAMINATION

BSC [MSCS] I YEAR –STATISTICS-PAPER-I

TIMING:3 HRS

MAX MARKS-100

Note: Answer all questions. All questions carry equal marks. Answer question I to IV by choosing any "2" from each any "3" from question-V

## Section-I

1. Distinguish primary data with Secondary data?
2. Define central and Non-central moments. In a certain distribution the first 4 moments about the point 4 are -1.5, 17,-30 & 108 respectively. Find the Kurtosis of the frequency curve and comment on its shape?
3. State and Prove Baye's theorem?
4. State and prove addition theorem of probability for 'n' events?

## Section-II

5.A random variable 'X' has the following probability distribution

| X: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| P(x): | a | 3a | 5a | 7a | 9a | 11a | 13a | 15a | 17a |

Find the value of (a) a,(b)$p(x<3)$ (c) $P(x>=3)$ (d) $P(0<x<5)$ (e) $P(x<=7)$

6. State and Prove Cauchy-Schwartz inequality

7.State Chebychev's inequality and give any two applications

8. Define MGF and CGF of a random variable. Establish the relationship between the moments and cumulates?

## Section-III

9.Define Binomial distribution. Obtain its MGF and hence find mean and variance

10. Obtain the recurrence relation between the central moments in Binomial distribution
11. Derive MGF of negative binomial distribution and hence show that mean and variance
12. Define Hyper-geometric distribution. derive mean and variance of it

## Section-IV

13. Define Gamma distribution and derive its MGF and CGF
14. Define normal distribution. Obtain its recurrence relation for moments. Hence find beta1 and beta2 and comment on the result
15. Define Beta distribution of second kind and find its mean and variance
16. X is normally distributed and mean of X is 12 and S.D is 4. Find out the following probabilities (i) $X>=20$ (ii) $X<=20$ (iii) $0<=X<12$

[given values of $P(0<=Z<=2)=0.4772$, $P(0<=Z<=3)=0.49865$]

## Section-V

17. Bernoulli distribution
18. Boole's inequality
19. Properties of characteristic function
20. Uniform distribution on [-a, a]
21. Memoryless property of geometric distribution

# PAPER-II

Code No. 4023 / BL

# FACULTIES OF ARTS AND SCIENCE

B.A / B.Sc. II Year (Backlog) Examination, March / April 2019

Subject: Statistics

Paper – II : Statistical Methods and Inference

Time: 3 Hours | Max. Marks: 100

**Note: Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculations are allowed.**

I 1 Describe the least squares procedure to fit an exponential curve $y = ae^{bx}$.
2 Define correlation ratio. Show that $1 \geq \eta_{yx}^2 \geq r_{yx}^2 \geq 0$.
3 Derive regression line equation of Y on X.
4 Derive the Spearman's rank correlation coefficient.

II 5 Define F-distribution. Establish relationship between F and Chi-square ($\chi^2$) distributions.
6 Write the statement of Neyman's factorization theorem. Find the sufficient statistic for the parameters $\mu$ and $\sigma^2$ of normal distribution.
7 Obtain the estimator for a Poisson distribution parameter $\lambda$ using method of moments.
8 Write short notes on properties of a good estimator.

III 9 If $x \geq 1$ is the critical region for testing $H_o$: $\theta = 2$ vs H; $\theta = 1$. On the basis of the single observation from an exponential distribution with p.d.f. $f(x, \theta) = \theta . e^{-\theta x}$. Obtain the value of
i) Type I error
ii) Type II error and
iii) Power of the test.
10 State and prove Neyman Pearson's Lemma.
11 Explain the large sample test procedure to test the significance for difference of means.
12 Explain the test procedure for testing the population correlation coefficient.

IV 13 Explain Chi-square ($\chi^2$) – test for independence of attributes.
14 Explain the test procedure for paired t-test.
15 Explain:
i) Nominal scale
ii) Ordinal scale
iii) Interval scale and
iv) Ratio scale
16 Explain the procedure of Wilcoxon – signed Rank Test.

V Write short notes on any three of the following:
17 Limits for correlation coefficient
18 Properties of MLE
19 Order statistics
20 Run test
21 Fitting of a straight line.

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Code No. 7526 / BL / S

# FACULTIES OF ARTS AND SCIENCE

B.A. / B.Sc. II – Year (Backlog) Examination, October / November 2018

Subject : STATISTICS (Theory)

Paper – II

Statistical Methods and Inference

Time : 3 hours

Max. Marks : 100

***Note : Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.***

I 1 Derive the formula for Spearman's Rank correlation coefficient. Discuss the problem of ties.

2 Given the two lines of regression $4x - 5y + 33 = 0$ and $20x - 9y - 107 = 0$. The variance of X is 9. Find i) mean value of X ii) standard deviation of Y and iii) correlation coefficient.

3 Explain the Principle of Least Squares. Derive the normal equations for fitting curve $y = ae^{bx}$.

4 Define Consistency of data. Show that for n attributes $A_1, A_2, \ldots\ldots A_n$, $(A_1 A_2 \ldots\ldots A_n) \geq (A_1) + (A_2) + \ldots + (A_n) - (n-1)N$. Where N is the population size.

II 5 Define t-statistic. Give the p.d.f. of t-distribution. State its properties and applications.

6 i) Define parameter, statistic, sampling distribution and standard error.
ii) Find the standard error of sample mean in case of normal population.

7 Define unbiasedness and consistency. Let $x_1, x_2 \ldots\ldots x_n$ be a random sample of size n drawn from a population with mean $\mu$ and variance $\sigma^2$. Show that $S^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$ is not an unbiased estimator of $\sigma^2$.

8 Explain the method of Maximum Likelihood Estimation. Find the Estimator for the parameter $\theta$ of exponential distribution on the basis of a sample of n observations.

III 9 State and Prove Neyman Pearson's Lemma.

10 Obtain the Most Powerful Test for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1$ in case of a random sample $x_1, x_2, \ldots\ldots x_n$ from the exponential population.

11 Explain the large sample test procedure for testing the significance of i) Single mean ii) Difference of means.

..2

12 i) Describe the large sample test procedure for testing the difference between observed sample correlation coefficient and population correlation coefficient.

ii) A machine produced 10 imperfect articles in a sample of 200. After the machine is overhauled, it produced 4 imperfect articles in a batch of 100. Has the machine improved? Two-tailed $Z_{1\%} = 2.58$, one tailed $Z_{1\%} = 2.33$.

IV 13 Explain the small sample test procedure for testing the difference between means in case of dependent and independent samples.

14 Stating the assumptions, explain the procedure of F-test for equality of two variances.

15 What are the advantages and disadvantages of Non-parametric tests over parametric tests. Explain the procedure of sign test.

16 Explain the Wilcoxon – Mann Whitney U test procedure.

V Write short notes on any **Three** of the following :

17 Karl Pearson's coefficient of correlation and its properties

18 Method of maximum likelihood estimation

19 Large sample test procedure for single proportion

20 Run test

21 Order Statistics



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G. Ravindra Reddy
Lec In Statistics



Code No. 7526 / BL

# FACULTIES OF ARTS AND SCIENCE

B.A. / B.Sc. II – Year (Backlog) Examination, March / April 2018

Subject : STATISTICS (Theory)

Paper – II

Statistical Methods and Inference

Time : 3 hours Max. Marks : 100

*Note : Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.*

I 1 Define correlation. Show that correlation coefficient is independent of the change of origin and scale.

2 Explain the principle of Least Squares. Derive the normal equations for fitting a straight line.

3 State and prove any two properties of regression coefficients.

4 Define Yule's coefficient of association and coefficient of colligation. Derive the relationship between them.

II 5 Define chi-square distribution. State its properties and applications.

6 State Fisher's Neyman Factorization theorem. Find the sufficient statistic for the parameter of exponential distribution.

7 Explain the method of Maximum Likelihood Estimation (MLE). Find the MLE for the parameter of Poisson distribution on the basis of a sample of n observations.

8 Explain interval estimation. Obtain 100(1-$\alpha$)% confident interval for the parameter $\mu$ of normal distribution when $\sigma^2$ is known.

III 9 State and Prove Neyman Pearson's Lemma.

10 Define Type I and Type II errors. A coin is tossed 6 times and the hypothesis $H_0 : p = \frac{1}{2}$ is rejected if the number of heads is greater than 4. Find the sizes of Type I and Type II errors if the alternative hypothesis $H_1 : p = \frac{1}{4}$.

11 Explain the large sample test procedure for testing the equality of two population proportions.

98





12 i) Describe the large sample test procedure for testing the single mean.

ii) A correlation coefficient of 0.72 is obtained from a sample of 39 pairs of observations. Can the sample be regarded as drawn from a bivariate normal population in which the true correlation coefficient is 0.8.

IV 13 i) Explain the small sample test procedure for testing the equality of variances of two populations.

ii) Ten individuals are chosen at random from a population and their heights are found to be (in inches) : 63, 63, 66, 67, 69, 68, 70, 70, 71, 71. Test whether the sample can be regarded as drawn from a normal population with mean height of 66 inches? (Table value = 2.26).

14 For a 2 X2 contingency table, derive the $\chi^2$ – test statistic.

15 What are the advantages and disadvantages of Non-parametric tests over parametric tests? Explain the procedure of Run test.

16 Explain the Wilcoxon – Mann Whitney U test procedure.

V Write short notes on any **Three** of the following:

17 Angle between two regression lines

18 Method of Moments

19 Confidence interval for standard deviations

20 Median test

21 Correlation Vs regression

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1051–14–463–U.–

Code No. 2026 / S

99

# FACULTIES OF ARTS AND SCIENCE

## B.A. / B.Sc. II – Year Examination, October / November 2016

### Subject : STATISTICS (Theory)

### Paper – II

### Statistical Methods and Inference

Time : 3 hours                                                        Max. Marks : 100

*Note : Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.*

I 1 State and prove the properties of regression coefficients.

2 Explain the principle of least squares, by using the same fit the curve $y = ab^{r}$.

3 Two variables X and Y with 50 pairs of observations found to have $\overline{X} = 10$, $\sigma_x = 3$, $\overline{y} = 6$, $\sigma_y = 2$ and $\gamma(x, y) = 0.3$. But subsequently it was found that one pair of values X = 10 and Y = 6 were wrong and hence weeded out with the remaining 49 pairs of observations, find how much the values of '$\gamma$' is affected.

4 What is association of attributes? How is it measured? Explain various measures of association for a two way data.

II 5 Define t-distribution. State its properties and also give its applications.

6 Define criteria for a good estimator.

7 Define sufficiency of an estimator. State Fisher Neymann factorization theorem. Let $x_1, x_2 \ldots\ldots\ldots x_n$ be a random sample from Bernoulli B(1, p) population show that $\Sigma x_i$ is sufficient for p.

8 Explain the method of maximum likelihood estimation (MLE). State its properties.

III 9 State and prove Neyman-Pearson's lemma.

10 A coin is tossed 6 times and the hypothesis $H_0 : p = 1/2$ is rejected if the number of heads is greater than 4. Find the sizes of type and I and Type II errors if the alternative hypothesis is $H_1 : p = 1/4$ .

11 Define randomized and non-randomized test functions. Explain large sample test procedure for testing the significance of single mean.

12 Define Fisher's Z-transformation. Explain its application.

IV 13 Explain $\chi^2$ - test for independence of attributes.

14 Distinguish between parametric and non parametric tests.

15 Define a 'run' and the length of a run. Explain Wold Wolfowitz run test.

16 Define order statistics. State their distribution.

V Write short notes on any **Three** of the following :

17 Partial and Multiple correlation

18 Method of moments

19 Sign test

20 Large sample test for single proportion

21 Confidence Intervals

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Code No. 5556 / ET / S

# FACULTIES OF ARTS & SCIENCE

B.A. / B.Sc. II Year (Regular) Examination, October / November 2013

Subject: Statistics

Paper – II

Statistical Methods and Inference

Time: 3 Hours

Max.Marks: 100

Note: Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.

I. 1. Explain the fitting a second degree parabola using method of least squares.

2. Show that correlation coefficient '$\gamma$' is independent of change of origin and scale of values of the variables. Also prove that for two independent random variables $\gamma = 0$ and its converse is not true.

3. Explain what are regression lines. Why two regression lines are there? Derive the regression equation of Y on X.

4. i) Examine the consistency of the following data. N = 1,000; (A) = 600, (B) = 500, (AB) = 50, the symbols having their usual meanings.

ii) In a University Examination 65% of the candidates passed in English, 90% passed in the Second Language and 60% passed in the Optional subjects. Find out how many atleast should have passed the whole examination.

II. 5. Define $\chi^2$ - distribution. State its properties and applications along with assumptions, if any.

6. Define sufficient estimator. Let $X_1, X_2, \ldots X_n$ be a random sample from a population with pdf $f(x,\theta) = \theta x^{\theta-1}$; $0 < x < 1$, $\theta > 0$. Find sufficient estimator for $\theta$.

7. What is point estimation? State and prove invariance property of consistent estimators.

8. Explain the maximum likelihood method of estimation.

III. 9. State Neyaman-Pearson lemma. Obtain the best critical region of size $\alpha$ for testing $H_0$: $P=P_o$ against $H_1$: $P=P_1$ based on a sample of size one from a binomial population with pdf $f(x, \theta) = nc_x p^x (1-p)^{n-x}$.

10. Define (i) critical region (ii) two types of errors (iii) level of significance and (iv) power of a test.

11. Define null and alternative hypothesis. Explain the general procedure followed in testing of a hypothesis.

12. Explain the large sample test procedure for testing significant difference between two sample standard deviations.

IV. 13. For a 2 x 2 contingency table

| | |
|---|---|
| a | b |
| c | d |

show that

$$\chi^2 = \frac{N(ad-bc)^2}{(a+b)(a+c)(b+d)(c+d)}$$ where N= a+b+c+d.

14. Explain Wald-Wolfowitz's runs test.

15. State the conditions for the validity of $\chi^2$ – test. Explain $\chi^2$ – test for goodness of fit.

16. Describe nomial, ordinal, interval and ratio scales with one example for each.

V. Write short notes on any three of the following:

17. Scatter Diagram
18. Efficiency of an estimator
19. Relation between t and F distributions.
20. Sampling distribution
21. Sign test.

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102

Total Printed Pages : 3 Code No. 8058/ET/S

# FACULTIES OF ARTS & SCIENCE 202242

## B.A./B.Sc. II Year Examination, October/November 2012

Subject : STATISTICS (REGULAR)

Paper : II (Statistical Methods and Inference)

**Time : 3 Hours ]** **[ Max. Marks : 100**

Note : Answer all questions. All questions carry equal marks. Answer questions I to IV by choosing any two from each and three from V. Scientific calculators are allowed.

I. 1. Describe the least square procedure to fit the exponential curve $y = ae^{bx}$.

2. Show that correlation coefficient is independent change of origin and scale.

3. Derive Regression equation of y on $x$

4. Find the Relationship between Yule's coefficient of association and coefficient of colligation.

II. 5. Define $\chi^2$-distribution. State its properties and applications.

6. Define the following terms and give one example for each.

(a) consistency (b). unbiasedness

(c) efficiency (d) sufficiency

7. State the asymptotic properties of maximum likelihood estimation.

8. Explain confidence Interval and confidence limits of the parameter and hence for a sample of 400 observations from normal population with mean 95 and SD 12. Find 95% confidence limits for the population mean.

III. 9. State and prove Neyman Pearson Lemma.

10. Define sample proportion and population proportion. Explain the test procedure for single proportion.

11. Derive the large sample test procedure for difference of means.

12. Describe the test procedure for Fisher's Z Transformation for difference of correlation coefficient.

In a large consignment of oranges, a random sample of 64 oranges revealed that 14 oranges were bad. Is it reasonable to assume that 20% of the oranges were bad test at 1% level

Contd...2

IV. 13. Derive the small sample procedure for difference of means for Independent samples.

14. Describe the $\chi^2$-test for Independence of attributes.

15. Explain the median test procedure.

16. Describe the test procedure for wolfowitz's run test.

V. Write short notes on *any three* of the following :

17. Scatter diagram

18. Multiple correlation

19. Type-I and Type-II Error

20. Yule's coefficient of association

21. Measurement of scale

## TELUGU VERSION

సూచన : ప్రశ్నలు I నుంచి IV వరకు ప్రతి దానిలో ఏవేని **రెండింటికి** మరియు ప్రశ్న V లో ఏవేని **మూడింటికి** సమాధానము వ్రాయండి. అన్ని ప్రశ్నలకు మార్కులు సమానము. శాస్త్రీయ గణనయంత్రములు అనుమతింపబడును.

I. 1. కనిష్ఠ వర్గముల పద్ధతిలో ఘాత వక్రము $y=ae^{bx}$ ను సంధానించుము.

2. మూల బిందు మరియు పరిమాణ మార్పులకు సహ సంబంధ గుణకము స్వతంత్రమని చూపండి.

3. y on $x$ యొక్క ప్రతిగమన సమీకరణమును ఉత్పాదించండి.

4. యూల్స్ యొక్క సాహచర్య మరియు కాలిగేషన్ (colligation) గుణకముల మధ్య గల సంబంధమును కనుగొనుము.

II. 5. $\chi^2$- విభాజనమును నిర్వచించండి. దాని యొక్క ధర్మములను మరియు వినియోగములను ప్రవచించండి.

6. క్రింది పదములను నిర్వచించండి మరియు ప్రతి దానికి ఒక ఉదాహరణను యివ్వండి.

(a) నిలకడ (b) నిష్పాక్షికత

(c) సామర్థ్యము (d) పర్యాప్తము

7. గరిష్ఠ సంభావ్యతా అంచనా పద్ధతి యొక్క అనంత స్పర్శ ధర్మములను ప్రవచించండి .

Total Printed Pages : 3

Code No. 1579/ET

# FACULTIES OF ARTS AND SCIENCE

## B.A./B.Sc. II-Year Examination, March/April 2011

Subject : STATISTICS

Paper : II - Statistical Methods and Inference

**Time : 3 Hours ]** **[ Max. Marks : 100**

*Note : Answer all questions. All questions carry equal marks. Answer questions I to IV by choosing any two from each and three from V. Scientific calculators are allowed.*

I. 1. Define the principle of least squares. Obtain the normal equations for fitting of Parabolic equation.

2. State and prove properties of regression coefficients.

3. Explain Partial correlation with an example.
If $r_{12}=0.80$, $r_{13}=-0.40$ and $r_{23}=-0.56$ find the values of $r_{12.3}$, $r_{13.2}$ and $r_{23.1}$

4. Derive Yule's coefficient of association . State its relationship with coefficient of colligation.

II. 5. Define t-distribution. State its properties and applications.

6. Define consistency. Let $x_1, x_2, \ldots\ldots x_n$ is a random sample, drawn from $N(\mu,\sigma^2)$. Show that sample mean $\bar{x}$ and sample mean square $s^2$ are consistent estimators for $\mu$ and $\sigma^2$ respectively.

7. Explain the Method of Maximum likelihood estimation(MLE). Find M.L.E. for the Parameter $\lambda$ of a Poisson distribution on the basis of a sample of n observations.

8. Explain the difference between Point and Interval estimation with two examples each.

III. 9. Obtain MP-test for testing $H_0 : \theta=\theta_0$ vs $H_1 : \theta=\theta_1$ in case of a random sample $x_1, \ldots\ldots\ldots x_n$ from $N(\theta, \sigma^2)$ where $\sigma^2$ is known.

10. Explain large sample test procedure for single mean.
A sample of 900 members has mean 3.4 cms. Is the sample from the population with mean 3.25 cms and s.d 2.61 cms ? Also find 95% confidence limits.

11. Explain Fisher's Z-transformation and its application.

12. Explain large sample test procedure for difference of standard deviations.

Contd...2

101221

Code No. 1579/ET

Total Printed Pages : 3

# FACULTIES OF ARTS AND SCIENCE

## B.A./B.Sc. II-Year Examination, March/April 2011

Subject : STATISTICS

Paper : II - Statistical Methods and Inference

Time : 3 Hours ] [ Max. Marks : 100

Note : *Answer all questions. All questions carry equal marks. Answer questions I to IV by choosing any two from each and three from V. Scientific calculators are allowed.*

I. 1. Define the principle of least squares. Obtain the normal equations for fitting of Parabolic equation.

2. State and prove properties of regression coefficients.

3. Explain Partial correlation with an example.
If $r_{12}=0.80$, $r_{13}=-0.40$ and $r_{23}=-0.56$ find the values of $r_{12.3}$, $r_{13.2}$ and $r_{23.1}$

4. Derive Yule's coefficient of association . State its relationship with coefficient of colligation.

II. 5. Define t-distribution. State its properties and applications.

6. Define consistency. Let $x_1, x_2, \ldots\ldots x_n$ is a random sample, drawn from $N(\mu,\sigma^2)$. Show that sample mean $\bar{x}$ and sample mean square $s^2$ are consistent estimators for $\mu$ and $\sigma^2$ respectively.

7. Explain the Method of Maximum likelihood estimation(MLE). Find M.L.E. for the Parameter $\lambda$ of a Poisson distribution on the basis of a sample of n observations.

8. Explain the difference between Point and Interval estimation with two examples each.

III. 9. Obtain MP-test for testing $H_0 : \theta=\theta_0$ vs $H_1 : \theta=\theta_1$ in case of a random sample $x_1, \ldots\ldots\ldots x_n$ from $N(\theta, \sigma^2)$ where $\sigma^2$ is known.

10. Explain large sample test procedure for single mean.
A sample of 900 members has mean 3.4 cms. Is the sample from the population with mean 3.25 cms and s.d 2.61 cms ? Also find 95% confidence limits.

11. Explain Fisher's Z-transformation and its application.

12. Explain large sample test procedure for difference of standard deviations.

Contd...2

101221

IV 13. Explain the test procedure for randomness with large sample approximation.

14. Define order statistics and state their distributions.

15. Explain the test procedure for testing equality of two population variances.

16. Compare sign and Wilcoxon signed ranktests.

V Write short notes on any three of the following :

17. Median test

18. Spearman's rank correlation coefficient

19. Central limit theorem

20. Multiple correlation.

21. F distribution.

## (Telugu Version)

సూచన : ప్రశ్నలు I నుండి IV వరకు ప్రతి దానిలో ఏవేని రెండింటికి మరియు ప్రశ్న V లో ఏవేని మూడింటికి సమాధానము వ్రాయండి. అన్ని ప్రశ్నలకు మార్కులు సమానము. శాస్త్రీయ గణన యంత్రములు అనుమతింపబడును.

I. 1. కనిష్ట వర్గము యొక్క సూత్రమును నిర్వచించండి. పరావలయ సమీకరణమును సంధానించు సాధారణ సమీకరణములను రాబట్టండి.

2. ప్రతిగమన గుణకము ధర్మములను ప్రవచించి నిరూపించండి.

3. పాక్షిక సహ సంబంధమును ఉదాహరణ సహితముగా వివరించండి మరియు $r_{12} = 0.80$, $r_{13} = -0.40$ మరియు $r_{23} = -0.56$లు అయిన $r_{12.3}$, $r_{13.2}$మరియు $r_{23.1}$లను కనుక్కోండి.

4. యూల్ యొక్క సంబంధ గణకము (Yule's coefficient of association) ను ఉత్పాదించండి. దీనికి coefficient of colligation తో గల సంబంధమును తెలుపండి.

II. 5. t - విభాజనమును నిర్వచించండి. దాని యొక్క ధర్మములను మరియు వినియోగములను ప్రవచించండి.

6. నిలకడను నిర్వచించండి. సాధారణ విభాజనము $N(\mu, \sigma^2)$ నుంచి $x_1, x_2, \ldots\ldots x_n$ అను యాదృచ్ఛిక ప్రతిరూపము వచ్చిన, దాని ప్రతిరూప సగటు మరియు ప్రతిరూప వర్గ సగటు $s^2$ లు వరుసగా $\mu$ మరియు $\sigma^2$ లకు నిలకడ అంచనాలని చూపండి.

Contd...3

# PAPER-III

Code No. 4024 / BL

# FACULTIES OF ARTS AND SCIENCE

**B.A / B.Sc. III Year (Backlog) Examination, March / April 2019**

**Subject: Statistics**
**Paper – III : Applied Statistics**

**Time: 3 Hours** **Max. Marks: 100**

**Note: Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculations are allowed.**

I
1 Discuss briefly the basic principles of sample survey.
2 Define SRSWR. Prove that in SRSWR, the sample mean square is an unbiased estimator of the population variance.
3 Derive variance of sample mean $V(\bar{y}_{st})$ in proportional and optimum allocations under stratified random sampling.
4 If a population consists of a linear trend, then prove that $V(\bar{y}_{st}) \leq V(\bar{y}_{sys}) \leq V(\bar{y}_n)_R$.

II
5 Explain ANOVA two-way classification, stating the assumptions.
6 Derive expectation of sum of squares of CRD.
7 What is randomized block design. Explain ANOVA of RBD, stating the assumptions.
8 Derive relative efficiency of LSD over RBD.

III
9 Explain any two different methods of estimating trend in a time series data in detail. Give their merits and demerits.
10 Justify 'Fisher index is an ideal index number'.
11 What are the functions of CSO and NSSO?
12 Define:
a) Whole sale price index
b) Cost of living index number and give their uses.

IV
13 Fill in the blanks of the following life table where question marks are given.

| Age | $l_x$ | $d_x$ | $p_x$ | $q_x$ | $L_x$ | $T_x$ | $e_x^o$ |
|---|---|---|---|---|---|---|---|
| 25 | 5,62,324 | ? | ? | ? | ? | 2,52,76,840 | ? |
| 26 | 5,56,432 | - | - | - | - | ? | ? |

14 Define:
i) Crude birth rate
ii) General fertility rate
iii) Specific fertility rate
15 Explain methods for measuring elasticity of demand.
16 Describe Pigou's method and write its limitations.

V Write short notes on any three of the following:
17 Proportional and optimum allocation
18 Local control with respect to CRD, RBD and LSD
19 Long term variations
20 Uses of index numbers
21 Market equilibrium.

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109

# PAPER-IV

Code No. 18625

# FACULTY OF SCIENCE

B.Sc. III-Year (Backlog) Examination, October / November 2021

Subject: Statistics

Paper-IV: (E-I) Quality Control, Reliability and Operations Research

Time: 2 Hours Max. Marks: 100

Note: Answer any four questions by choosing any two bits from I-V units. All questions carry equal marks. Scientific calculators are allowed.

(4x25=100 marks)

I

1. How do you construct fraction defective and number of defective charts?
2. How do you construct c-chart and what are applications of c-chart?
3. Define statistical quality control. Construct a standard deviation chart.
4. From the following data construct mean and range charts and comment on state of control.

| Sample No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 20 | 34 | 45 | 39 | 26 | 29 | 13 | 34 | 37 | 23 |
| Range | 23 | 39 | 15 | 5 | 20 | 17 | 21 | 11 | 40 | 10 |

II

5. Explain double sampling plans for attributes of their O.C. and ASN functions.
6. Explain the terms AQL, LTPD, procedures risk and consumer's risk
7. Define(i) Component and system reliability (ii) Hazard rate
   (i) Failure density (iv) Series and parallel system
8. Explain the method to compute the reliability of a system having series configuration. The component reliabilities of three components are respectively 0.8,0.75 and 0.98. Obtain the system reliability when the system consisting of these three components is in (i)Series and (ii) parallel.

III

9. Explain the procedure of obtaining the optimum solutions of the primal and the dual from the optimum table of the simplex procedure.
10. Define dual of an L.P.P. obtain the dual of the following primal. Also verify that the dual of the dual problem is primal problem.

Max $z = 2x_1 + 5x_2 + 6x_3 \le 3$

S.T.C $5x_1 + 6x_2 - x_3 \le 3$

$x_1 - 5x_2 + 3x_3 \le 1$

$-2x_1 + x_2 + 4x_3 \le 4$

$-3x_1 - 3x_2 + 7x_3 \le 6$

and $x_1, x_2, x_3 \ge 0$

11. Use Simple method to solve the following L.P.P

Maximize $z = 2x_1 + 4x_2 + 5x_3$

$x_1 + 2x_2 + x_3 \le 430$

$3x_1 + 2x_3 \le 460$

$x_1 + 4x_3 \le 420$

and $x_1, x_2, x_3 \ge 0$.

12. Explain simplex method of solving L.P.P.

IV:

13. Explain Hungarian method of solving assignment problem.
14. Find the sequence that minimizes the total elapsed time in performing the six jobs on three machines in the order $M_1, M_2, M_3$. Also find the elapsed time for machines $M_1, M_2, M_3$

| Job | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Machine M1 | 8 | 3 | 7 | 2 | 5 | 1 |
| Machine M2 | 3 | 4 | 5 | 2 | 1 | 6 |
| Machine M3 | 8 | 7 | 6 | 9 | 10 | 9 |

15 . Solve the following T.P.

| Origin/destinations | d1 | d2 | d3 | d4 | Supply |
|---|---|---|---|---|---|
| O1 | 1 | 2 | 1 | 4 | 30 |
| O2 | 3 | 3 | 2 | 1 | 50 |
| O3 | 4 | 2 | 5 | 9 | 20 |
| demand | 20 | 40 | 30 | 10 | |

16 Explain Degeneracy in a transportation problem and how do you resolve the degeneracy in transportation problem.

V Write a short note on any two of the following:

1. Rectifying inspection plans
2. Mean Time to Failure
3. Slack and Surplus variables
4. Transportation problem as a particular case of LPP.
5. Transshipment problem

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Code No. 4025 / BL

# FACULTIES OF ARTS AND SCIENCE

**B.A / B.Sc. III Year (Backlog) Examination, March / April 2019**

**Subject: Statistics**

**Paper – IV (Elective – I)**
**Quality Control, Reliability and Operations Research**

**Time: 3 Hours** **Max. Marks: 100**

**Note: Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculations are allowed.**

I 1 What do you understand by Statistical Quality Control? Give its importance in industry. Distinguish between process control and product control.

2 Explain the construction procedure of $\overline{X}$ and R charts.

3 Explain the difference between specification limits, tolerance limits and control limits in SQC,

4 Give the construction procedure and applications of C – chart.

II 5 Explain double sampling plans for attributes of their OC and ASN functions.

6 Define:

i) OC and ASN functions

ii) ATI and AOQL

7 Show that for exponential failure density hazard rate is constant.

8 Explain series configuration of a system and derive the reliability of the system.

III 9 State and prove fundamental theorem of LPP.

10 Solve the following LPP graphically

Minimize $Z = 4X_1 + 2X_2$

Subject to the constraints: $X_1 + X_2 \geq 2$

$3X_1 + X_2 \geq 3$

$4X_1 + 3X_2 \geq 6$

and $X_1, X_2 \geq 0$

11 Solve the following LPP using Big-M method.

Maximize $Z = 3X_1 - X_2$

Subject to the constraints: $2X_1 + X_2 \geq 2$

$X_1 + 3X_2 \leq 3$

$X_2 \leq 4$

and $X_1, X_2 \geq 0$

12 Define convex set and state their properties.

IV 13 Solve the following transportation problem.

| Destinations / Origins | $D_1$ | $D_2$ | $D_3$ | Availability |
|---|---|---|---|---|
| $O_1$ | 50 | 30 | 220 | 1 |
| $O_2$ | 90 | 45 | 170 | 3 |
| $O_3$ | 250 | 200 | 50 | 4 |
| Requirements | 4 | 2 | 2 | 8 |

14 A salesman has to visit five cities. The distances in miles between the five cities are given below:

$$\text{From}\quad \begin{array}{c} \\ A \\ B \\ C \\ D \\ E \end{array} \begin{array}{c} \text{To} \\ \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{pmatrix} - & 6 & 12 & 6 & 4 \\ 6 & - & 10 & 5 & 4 \\ 8 & 7 & - & 11 & 3 \\ 5 & 4 & 11 & - & 5 \\ 5 & 2 & 7 & 8 & - \end{pmatrix} \end{array}$$

If the salesman starts from city I and has to come back to city I. Which route should be selected so that the total distance traveled is minimum?

15 How the degeneracy is occurred in transportation problem. How is it resolved?

16 Describe the method of processing n jobs through three machines.

V Answer any **three** of the following:

17 Six sigma limits

18 AQL and LTPD

19 North West corner rule

20 Assignment problem

21 Process control, product control.

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114

Code No. 7528 / BL / S

# FACULTIES OF ARTS AND SCIENCE

B.A. / B.Sc. III – Year (Backlog) Examination, October / November 2018

Subject : STATISTICS (Theory)

Paper – IV

Quality Control, Reliability and Operations Research (Elective-I)

Time : 3 hours Max. Marks : 100

*Note : Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.*

I 1 Define SQC. Brief some of the advantages of it.

2 a) Construct 3-sigma control limits for d-chart.
b) A daily sample of 30 items was taken over a period of 14 days in order to derive an attribute control chart. If 21 defectives were found, what should be the upper and lower control limits for the number of defectives.

3 Define control charts for variables. Explain mean chart based on standard deviation.

4 20 tape recorders were examined for quality control test. Data collected for the number of defects for each tape recorder. Explain the suitable control chart to check the quality.

II 5 Design the construction of Double sampling plan.

6 Design the construction and derive the OC curve of single sampling plan.

7 Explain the terms : i) Hazard rate ii) Reliability iii) Probability of failure iv) Mean time to failure

8 Explain the method to compute the reliability of a system having series configuration.

III 9 State and prove fundamental theorem of LPP.

10 Explain the concept of duality with an example.

11 Explain big-M method for introducing an artificial variable in LPP.

12 What is degeneracy in LPP? How do you resolve it?

IV 13 Explain MODI method in transportation problem.

14 Define Transportation problem and assignment problem as a special case of LPP.

15 a) Explain Johnson's algorithm for sequencing of n jobs on 3 machines.
b) Give an example of sequencing problem.

16 Explain transshipment problem.

**V** Write short notes on any **three** of the following :

17 Unbalanced Transportation problem
18 Producer's risk and Consumer's risk
19 Reliability function
20 Hungarian method in Assignment problem
21 Convex sets

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