# Sadhana Education Society

# L. S. RAHEJA

## COLLEGE OF ARTS & COMMERCE,

### SANTACRUZ (W), MUMBAI - 400 054.

## DEPARTMENT OF MATHEMATICS, STATISTICS & COMPUTERS (FYBCOM)

## PREPARED BY

### Dr. Mrs. Seema A. Ukidve,
### Dr. Mrs. Neelam N. Yadav
### Shri Ramsagar B. Yadav

# TUTORIAL WORKBOOK

# DEPARTMENT OF MATHEMATICS, STATISTICS & COMPUTERS

## SEMESTER I and II 2019-20

## **<u>TUTORIAL WORKBOOK</u>**

## <u>PREPARED BY:</u>

1- <u>**Dr. Mrs. Seema A. Ukidve**</u>
2- <u>**Dr. Mrs. Neelam N. Yadav**</u>
3- <u>**Mr. Ramsagar B. Yadav**</u>

# Why this tutorial handbook is introduced?

"Mathematics is not about numbers, equations, computations or algorithms: it is about understanding."

_____**William Paul Thurston**

"The only way to learn Mathematics is to do Mathematics."

_____**Paul Halmos**

It has been observed that students enrolling for F.Y.B.COM lack basics of Mathematics and Statistics as some of them opt for Secretarial Practice in F.Y.J.C and S.Y.J.C instead of Mathematics due to which they loose connect with mathematical concepts and rigour.

To boost the confidence of students and to make them understand Mathematics and Statistics lessons taught in the class and to provide them hand on practice of standard questions this tutorial handboook has been introduced.

This tutorial handbook contains:

- ✓ Latest Syllabus of Mathematical and Statistical techniques paper ,
- ✓ Paper Pattern
- ✓ Reference Books
- ✓ Unit wise questions for practice with enough space to solve them
- ✓ Graph Papers

We hope this handbook will inculcate the problem solving aptitude among students and remove their mathematics phobia.

## SYLLABUS FOR MATHEMATICAL AND STATISTICAL TECHNIQUES AT

## F.Y.B.Com. EXAMINATION

### Revised Course

### (WITH EFFECT FROM THE ACADEMIC YEAR 2016-2017)

**Why Revision?**

There is a Rapid expansion of knowledge in subject matter areas and improved instructional method during last decade. There are considerable curricular revisions happening at the high school level. Application of Mathematics and Statistics are widely used in industry and business. Keeping this in mind, a revision of syllabus required in accordance with the growth of subject of at the high school level and emerging needs of industry and its application.

**Objective:**

The main objective of this course is to introduce mathematics and statistics to undergraduate students of commerce, so that they can use them in the field of commerce and industry to solve the real life problems.

**Distribution of topics and lectures**

a. **Workload :**

**Theory:** 5 lectures per week of which 2 lectures are for Mathematics and 3 lectures for Statistics.

**Tutorial:** 1 lecture per week per batch. Batch size is as prescribed by the University.

**No. of working weeks** in a semester: 15

**Total no. of lectures in a semester**: 15 * 5 = 75

Introductory lecture of about 120 minutes may be arranged for students who did not offer general mathematics in the $9^{th}$ & $10^{th}$ Standard and/or Mathematics at the $XI^{th}$ and $XII^{th}$ to familiarize the students with the concept of Tabulation, Graphical Representation of the data (basically Histogram and Ogives)

## Semester I

| Course | Topic | No. of lectures |
|---|---|---|
| **UBCOMFSI.6** | Unit I | 15 |
| **Mathematical** | Unit II | 15 |
| **and** | Unit III | 15 |
| **Statistical** | Unit IV | 15 |
| **Techniques-I** | Unit V | 15 |
| | Total | 75 |

Total number of lectures 75 **+Notional75=150** lectures = **3** CREDITS

## Semester II

| Course | Topic | No. of lectures |
|---|---|---|
| **UBCOMFSII.6** | Unit I | 15 |
| **Mathematical** | Unit II | 15 |
| **and** | Unit III | 15 |
| **Statistical** | Unit IV | 15 |
| **Techniques-II** | Unit V | 15 |
| | Total | 75 |

Total number of lectures 75 **+Notional 75=150** lectures = **3** CREDITS

# MATHEMATICAL AND STATISTICAL TECHNIQUES

WORKLOAD: MATHEMATICS           : 2 lectures per week

                STATISTICS           : 3 lectures per week

                TUTORIAL           : 1 per week

Tutorial batch size : 25 Students

## Semester I

### Course: UBCOMFSI.6

### Mathematical and Statistical Techniques-I

## [A] MATHEMATICS: (40 marks)

## Unit I: Shares and Mutual Funds

a. **Shares**: Concept of share, face value, market value, dividend, equity shares, preferential shares, bonus shares. Simple examples.

b. **Mutual Funds**: Simple problems on calculation of Net income after considering entry load, dividend, change in Net Asset Value (N.A.V.) and exit load. Averaging of price under the Systematic Investment Plan (S.I.P.)

## Unit II: Permutation, Combination and Linear Programming Problems:

**Permutation and Combination:** Factorial Notation, Fundamental principle of counting, Permutation as arrangement, Simple examples, combination as selection, Simple examples, Relation between $^nC_r$ and $^nP_r$ Examples on commercial application of permutation and combination.

**Linear Programming Problem:** Sketching of graphs of (i) linear equation $Ax + By + C = 0$ (ii) linear inequalities. Mathematical Formulation of Linear Programming Problems upto 3 variables. Solution of Linear Programming Problems using graphical method up to two variables.

**[B] STATISTICS: (60 marks)**

**Unit III: Summarization Measures:**

a. **Measures of Central Tendencies:** Definition of Average, Types of Averages: Arithmetic Mean, Median, and Mode for grouped as well as ungrouped data. Quartiles, Deciles and Percentiles. Using Ogive locate median and Quartiles. Using Histogram locate mode. Combined and Weighted mean.

**Measures of Dispersions**: Concept and idea of dispersion. Various measures Range, Quartile Deviation, Mean Deviation, Standard Deviation, Variance, Combined Variance

**Unit IV: Elementary Probability Theory:**

a. **Probability Theory:** Concept of random experiment/trial and possible outcomes; Sample Space and Discrete Sample Space; Events their types, Algebra of Events, Mutually Exclusive and Exhaustive Events, Complimentary events.

Classical definition of Probability, Addition theorem (without proof), conditional probability.

Independence of Events: $P( A \cap B ) = P(A) P(B)$. Simple examples.

b. **Random Variable**: Probability distribution of a discrete random variable; Expectation and Variance of random variable, simple examples on probability distributions.

**Unit V: Decision Theory**:

Decision making situation, Decision maker, Courses of Action, States of Nature, Pay-off and Pay-off matrix; Decision making under uncertainty, Maximin, Maximax, Minimax regret and Laplace criteria; simple examples to find optimum decision. Formulation of Payoff Matrix. Decision making under Risk, Expected Monetary Value (EMV); Decision Tree; Simple Examples based on EMV. Expected Opportunity Loss (EOL), simple examples based on EOL.

# Semester II

## Course: UBCOMFSII.6

## Mathematical and Statistical Techniques-II

## [A] MATHEMATICS : (40 marks)

### Unit I : Functions, Derivatives and Their Applications

a. **Concept of real functions:** constant function, linear function, $x^n$, $e^x$, $a^x$, log x. Demand, Supply, Total Revenue, Average Revenue, Total cost, Average cost and Profit function. Equilibrium Point, Break-even point.

b. **Derivative of functions:**

Derivative as rate measure, Derivative of $x^n$, $e^x$, $a^x$, log x

   i. Rules of derivatives: Scalar multiplication, sum, difference, product, quotient (Statements only), Simple problems. Second order derivatives.

   ii. Applications: Marginal Cost, Marginal Revenue, Elasticity of Demand. Maxima and Minima for functions in Economics and Commerce.

   (Examination Questions on this unit should be application oriented only.)

### Unit II: Interest and Annuity:

**Interest:** Simple Interest, Compound Interest (Nominal & Effective Rate of Interest),. Calculations involving upto 4 time periods.

**Annuity:** Annuity Immediate and its Present value, Future value. Equated Monthly Installments (EMI) using reducing balance method & amortization of loans. Stated Annual Rate & Affective Annual Rate Perpetuity and its present value. Simple problems involving up to 4 time periods

## [B] STATISTICS: (60 marks)

### Unit III: Bivariate Linear Correlation and Regression

a. **Correlation Analysis:** Meaning, Types of Correlation, Determination of Correlation: Scatter diagram, Karl Pearson's method of Correlation Coefficient (excluding Bivariate Frequency Distribution Table) and Spearman's Rank Correlation Coefficient.

b. **Regression Analysis:** Meaning, Concept of Regression equations, Slope of the Regression Line and its interpretation. Regression Coefficients (excluding Bivariate Frequency Distribution Table), Relationship between Coefficient of Correlation and Regression Coefficients , Finding the equations of Regression lines by method of Least Squares.

### Unit IV : Time series and Index Numbers

a. **Time series**: Concepts and components of a time series. Representation of trend by Freehand Curve Method, Estimation of Trend using Moving Average Method and Least Squares Method (Linear Trend only ). Estimation of Seasonal Component using Simple Arithmetic Mean for Additive Model only (For Trend free data only). Concept of Forecasting using Least Squares Method.

b. **Index Numbers:** Concept and usage of Index numbers, Types of Index numbers, Aggregate and Relative Index Numbers, Lasperye's, Paasche's, Dorbisch-Bowley's, Marshall-Edgeworth and Fisher's ideal index numbers, Test of Consistency: Time Reversal Test and Factor Reversal Test. Chain Base Index Nos. Shifting of Base year. Cost of Living Index Numbers, Concept of Real Income, Concept of Wholesale Price Index Number. (Examples on missing values should not be taken)

### Unit V: Elementary Probability Distributions

**Probability Distributions:**

i. Discrete Probability Distribution: Binomial, Poisson (Properties and applications only, no derivations are expected)

Continuous Probability distribution: Normal Distribution. (Properties and applications only, no derivations are expected

**Tutorial:**

Two tutorials to be conducted on each unit i.e. 10 tutorials per semester. At the end of each semester one Tutorial assignment of 10 marks should be given.

**Examination:**

**Semester End Examination: 100 marks**

At the end of each semester, there will be a Semester End Examination of 100 marks , 3 hours duration and question paper pattern as shown below.

**Question Paper Pattern :( Course: UBCOMFSI.6 and Course: UBCOMFSII.6)**

1.  In **Section I** (**based on Mathematics**), Two questions carrying 20 marks each. First question should be on Unit I and Second question should be from Unit II.
2.  In each question there should be five sub-questions carrying 5 marks each. Students should be asked to answer any 4 sub questions from each question.
3.  In **Section II** (**based on Statistics**), Three questions carrying 20 marks each. First question should be on Unit III, Second question should be from Unit IV and third question should be from Unit V.

4.  In each question there should be five sub-questions carrying 5 marks each. Students should be asked to answer any 4 sub questions from each question.

**Reference Books:**

1.  Mathematics for Economics and Finance Methods and Modelling by Martin Anthony and

    Norman Biggs, Cambridge University Press, Cambridge low-priced edition, 2000, Chapters 1, 2, 4, 6 to 9 & 10.

2.  Applied Calculus: By Stephen Waner and Steven Constenoble, Brooks/Cole Thomson Learning, second edition, Chapter 1 to 5.

3.  Business Mathematics By D. C. Sancheti and V. K. Kapoor, Sultan Chand & Sons, 2006, Chapter 1, 5, 7, 9 &10.

4. Mathematics for Business Economics: By J. D. Gupta, P. K. Gupta and Man Mohan, Tata Mc- Graw Hill Publishing Co. Ltd., 1987, Chapters 9 to 11 & 16.

5. Quantitative Methods-Part-I By S. Saha and S. Mukerji, New Central Book Agency, 1996, Chapters 7 & 12.

6. Mathematical Basis of Life Insurance By S.P. Dixit, C.S. Modi and R.V. Joshi, Insurance Institute of India, Chapters 2: units 2.6, 2.9, 2.20 & 2.21.

7. Securities Laws & Regulation of Financial Market : Intermediate Course Paper 8, Institute of Company Secretaries of India, Chapter 11

8. Investments By J.C. Francis & R.W. Taylor, Schaum's Outlines, Tata Mc-Graw Hill Edition 2000, Chapters 2,4 & section 25.1.

9. Indian Mutual Funds Handbook : By Sundar Shankaran, Vision Books, 2006, Sections 1.7,1.8.1, 6.5 & Annexures 1.1to 1.3.

10. STATISTICS by Schaum Series.

11. Operations Research by Gupta and Kapoor

12. Operations Research by Schaum Series

13. Fundamentals of Statistics - D. N. Elhance.

14. Statistical Methods - S.G. Gupta (S. Chand & Co.

15. Statistics for Management - Lovin R. Rubin D.S. (Prentice Hall of India)

16. Statistics - Theory, Method & Applications D.S.Sancheti & V. K. Kapoor.

17. Modern Business Statistics - (Revised}-B. Pearles & C. Sullivan –Prentice Hall of India.

18. Business Mathematics & Statistics : B Aggarwal, Ane Book Pvt. Limited

19. Business Mathematics : D C Sancheti & V K Kapoor, Sultan Chand & Sons

20. Business Mathematics : A P Verma, Asian Books Pvt. :Limited.

# QUESTION PAPER – SET I

## MARKS:- 100    TIME:- 3 HRS

**N.B:** (1) ALL QUESTION ARE COMPALSORY

(2) ALL QUESTION CARRY EQUAL MARKS

(3) FIGURES TO THE RIGHT INDICATE MARKS TO A SUB-QUESTION.

(4) GRAPGH PAPER WILL BE SUPPLIED ON REQUEST.

(5) USE OF NON-PROGRAMMABLE CALCULATOR IS ALLOWED.

## SECTION-I

Q.1 ATTEMPT ANY FOUR OF THE FOLLOWING

(a) 5 Marks (b) 5 Marks (c) 5 Marks (d) 5 Marks (e) 5 Marks                          20 Marks

Q.2 ATTEMPT ANY FOUR OF THE FOLLOWING

(a) 5 Marks (b) 5 Marks (c) 5 Marks (d) 5 Marks (e) 5 Marks

20 Marks

# SECTION-II

Q.3 ATTEMPT ANY FOUR OF THE FOLLOWING

(a) 5 Marks (b) 5 Marks (c) 5 Marks (d) 5 Marks (e) 5 Marks                    20 Marks

Q.4 ATTEMPT ANY FOUR OF THE FOLLOWING

(a) 5 Marks (b) 5 Marks (c) 5 Marks (d) 5 Marks (e) 5 Marks

Q.5 ATTEMPT ANY FOUR OF THE FOLLOWING

(a)  5 Marks (b) 5 Marks (c) 5 Marks (d) 5 Marks (e) 5 Marks

20 Marks

**Unit I: Shares and Mutual Funds**

**1- If the market price of a share with face value Rs. 100 is Rs. 130 , how many shares of the company can be bought for Rs. 3263, brokerage being 0.4%.**

**2- Smooth writing industry issued some shares of face value Rs. 10 each. A dividend of Rs. 7500 was declared by the company at 2.5% per share . Find number of shares issued by the company.**

**3- Neil purchased 1200 units of a mutual fund by investing Rs. 60000. If the entry load was 2% . Find NAV on the date of purchase.**

**4- Nihir invested Rs. 40000 in a mutual fund on 14-2-2012 when its NAV was Rs. 13.65 . A dividend of Rs. 3 per unit was given on 20-4-2012 . Afterwards he sold all the units on 20-8-2012 when NAV was Rs. 16.85 . Find his gain if there is no entry or exit load .**

**5- An Investor joined the SIP Scheme for a Mutual Fund under which he would invest Rs. 15000 for 5 months . If the NAVs for each month are Rs. 42.6 , Rs. 45, Rs. 47 , Rs. 47.5 and Rs. 60. Find the average cost using rupee averaging method , the entry load being 2.5% throughout for these months.**

**6- Find the Face Value of a share if an investment of Rs. 9,00,000 put in to purchase 8% shares quoted at Rs. 15 each, earned a total dividend of Rs.9600.**

**7- Mr. Chopra bought 400 shares of par value Rs. 10 each at the market price of Rs. 24 each. If the annual dividend distributed was at the rate of 12% , Find Mr. Chopra's total dividend and and rate of return on investment.**

**8-** Ram invested Rs. 18,000 in a mutual fund scheme with entry load of 2.25% at NAV Rs. 110 . How many units did he purchase ? The current NAV is Rs. 130 . Find the current value of his investment.

**9-** Katrina invested Rs. 15,000 on 5<sup>th</sup> of every month for 5 months in a SIP of a mutual fund. The N.A.V on these dates were Rs. 42.26 , Rs. 40.25 , Rs. 49.57. Rs. 51.45 and Rs. 39.32 respectively. There was the same entry load of 2.3% for all these months . Find the average acquisition cost per unit.

**10- Mr. Bhavesh invested Rs. 50,000/- in the purchase of mutual fund units at NAV Rs. 16.50 . Calculate the number of units purchased when the entry load of 1.2% was applied . How many more units he could have purchased if the scheme was load free ?**

## Unit II: Permutation, Combination and Linear Programming Problems:

**1. In how many different ways can the letters of the word 'LEADING' be arranged such that the vowels should always come together?**

**2. A committee of 5 persons to be formed from 6 doctors and 5 nurses . Find the total number of ways if committee consist of  i) All doctors ii) 3 doctors and 2 nurses**

**3. Solve the following L.P.P by graphical method.**

**Maximize:   Z = 4x + 5y**

**Subject to : 2x + 3y ≤ 12 ;**

**x + y ≤ 5 ;**

**x ≥ 0 & y ≥ 0.**

**4. Solve the following LPP graphically:**

**Minimize    Z = 9x + 10y,**

**Subject to: x + 2y ≥ 30,**

$$3x + y \geq 30,$$

$$x \geq 0, y \geq 0$$

**5. A printing company prints two types of magazines A and B. The Company earns Rs. 25 and Rs. 35 on each copy of magazines A and B respectively. The magazines are processed by 3 machines. Magazine A requires 2 hours on machine I, 4 hours on machine II and 2 hours on machine III. Magazine B requires 3 hours on machine I, 5 hours on machine II and 3 hours on machine III. Machines I, II and III are available for 35, 50 and 70 hours per week respectively. Formulate the L.P.P so as to maximize the total profit of the company.**

**6. From 4 professors and 6 students, a committee of 4 is to be formed. In how many ways the committee can be formed such that it contains only one professor.**

**7. How many numbers of 5 digits can be formed using the digits 1,2,3,4,5,6 such that**

**i) no digit is repeated**

**ii) repetition of digits is allowed**

**8. How many ways out of 11 members of a cricket team choose a Captain , Vice-Captain and Wicket-Keeper from among themselves ?**

**9. Solve the linear programming problem graphically:**

**Min.   Z = 10x + 7y**

**Subject to : 2x + y ≥ 2,**

   **x + 3y ≥ 3,**

   **x ≥ 0, y ≥ 0 .**

**10. A Cracker manufacturer produces two types of crackers , rockets and bombs packed in boxes of hundreds in its two factories . Factory I performs the basic assembly operation. Factory II performs the finishing operation. For financial reason , factory I has only 180 hours available per week and factory II has 120 hours available. Factory I needs 3 hours on each box of rockets and 10 hours on each box of bombs . Factory II needs 6 hours on box of rockets and 4 hours on box of bombs. The profit of the company is Rs. 45 per box of rockets and Rs. 55 per box of bombs. Formulate the LPP to maximize the profit.**

## Unit III: Summarization Measures:

1. The following are the runs scored by two batsmen A and B in 5 test matches. Decide who should be selected for the coming tour.

   Runs by batsman A: 56,58, 60, 62, 59

   Runs by batsman B: 70, 62, 50,35,69

2. The ages of 100 persons are tabulated below. Find $P_9$ and $P_{87}$.

| Age(Years) | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 |
|---|---|---|---|---|---|---|---|
| No. of persons | 16 | 20 | 21 | 28 | 10 | 3 | 2 |

3. Find the standard deviation for the following distribution.

| Size of Shoe | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|
| No. of Persons | 5 | 10 | 20 | 10 | 5 |

4. Calculate M.D from mean and its coefficient for the following data:

| x | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|----|----|----|----|----|----|----|
| f | 3  | 6  | 10 | 8  | 5  | 3  | 2  |

5. Find the median for the following data representing the age in years of children.

| Age in years | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|
| No. of children | 14 | 20 | 40 | 54 | 40 | 18 | 7 | 7 |

6. Find the first quartile and second quartile for the following data:

| Daily wages in ₹ | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 | 50-55 |
|---|---|---|---|---|---|---|---|---|---|
| No. of workers | 12 | 28 | 36 | 50 | 25 | 18 | 16 | 10 | 5 |
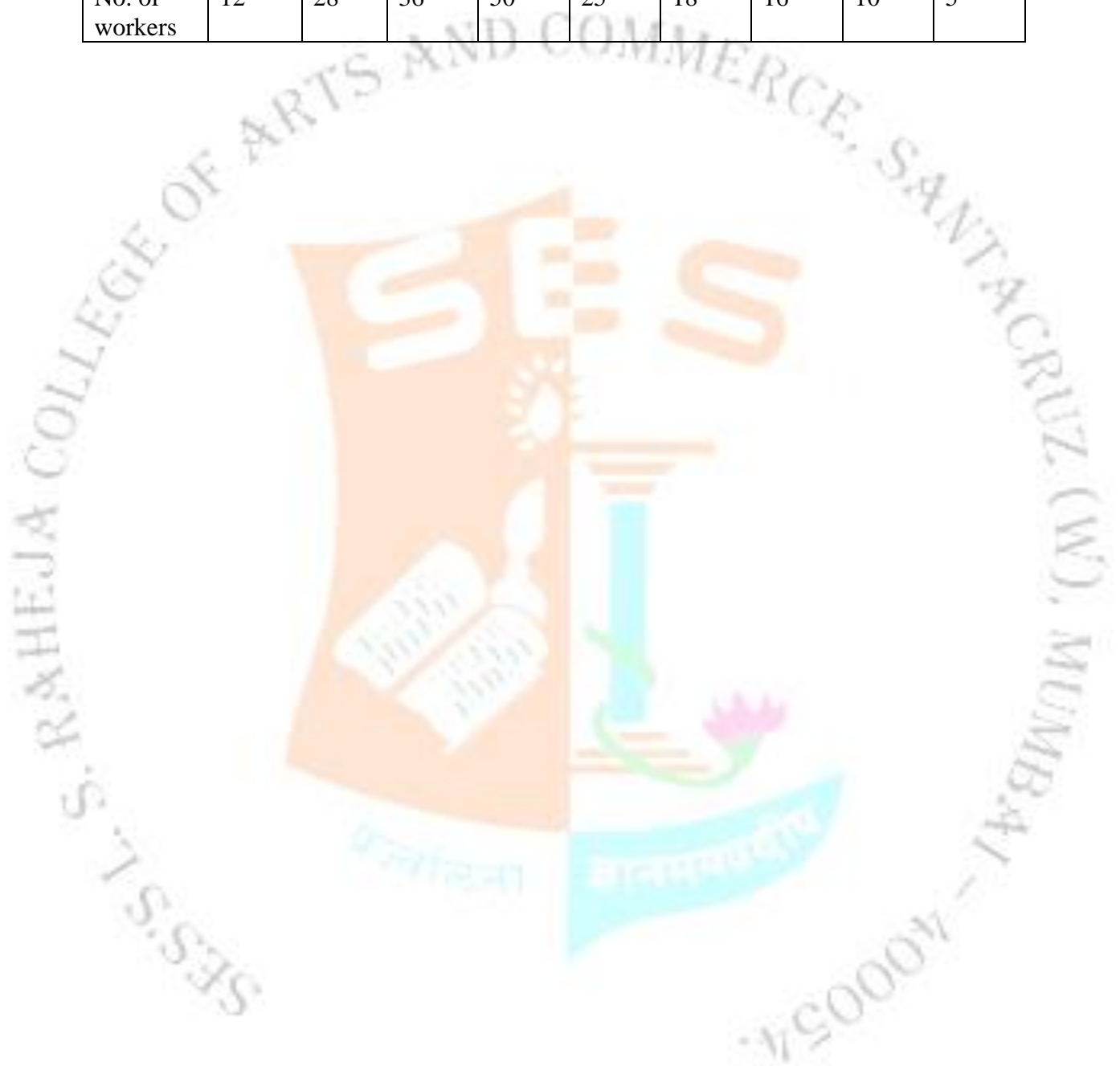
7. Find the mode for the following data:

| Income in Rs. | 2000-4000 | 4000-6000 | 6000-8000 | 8000-10000 | 10000-12000 |
|---|---|---|---|---|---|
| No. of persons | 16 | 34 | 60 | 37 | 13 |

## Unit IV: Elementary Probability Theory:

1) There are 3 doctors, 4 Engineers, 2 Statisticians and 1 Economists. A committee of 4 from among them is to be formed. Find the probability that the committee consists of
   a) One of each kind
   b) At least one Doctor

2) If the letters of the word "FATHER" are arranged at random, what is the chance that the two letters A and R will be at the either extremes?

3) A biased coin is tossed thrice. X denotes the number of heads in the three tosses. If the probability distribution of X is as follows:

$P(X = x) = 5/16$ ; x= 0,1

$= 1/8$ ; x= 2

$= 1/4$ ; x = 3

=0; otherwise

Find E(X) and V(X).

4) In a game of throwing a fair dice, A wins ₹60 if a 6 is thrown. He gains ₹30 if the dice shows 3 or 4 and he loses ₹30 if odd number occurs on the uppermost face of the dice. Find the expected gain of A.

5) If x is a random variable having probability distribution

$P(x)$ = x/8 ; x= 0,1

= k/ 4 ; x= 2

= kx/16 ; x = 3

Find the value of k and E(x).

6) From a well shuffled pack of cards, a card is drawn at random, find the probability that the card drawn is   (a) An ace  (b)  A heart card

7) A box contains 5 white balls and 3 black balls. If 5 balls are selected from the box, what is the probability that 3 of them are white?

8) If X is a number appearing on the uppermost face of a fair dice, find E(x) and V(x).

## Unit V: Decision Theory:

(A) Given the following pay-off table, decide the best decision using the criterion

a) Maximax
b) Maximin
c) Laplace
d) Minimax regret riterion

### Pay off Table

| Course of Action | States of Nature | | |
|---|---|---|---|
| | $S_1$ | $S_2$ | $S_3$ |
| $A_1$ | 2500 | 2500 | 2500 |
| $A_2$ | 4000 | 3500 | 2000 |
| $A_3$ | 2500 | 2000 | 1200 |

(B) Given the following profit table. Find the optimum decision using EMV Criterion.

Profit Table

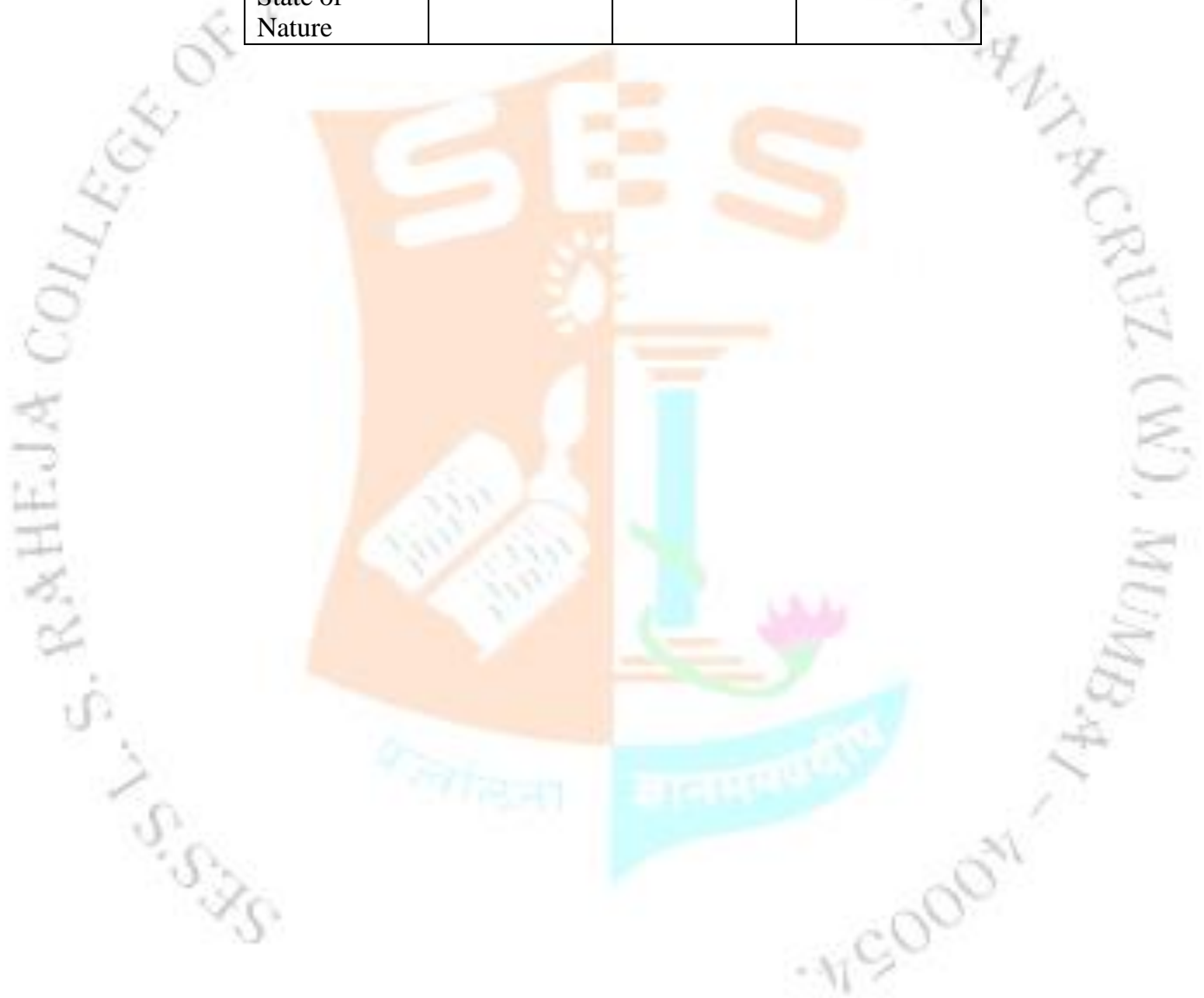| Course of Action | State of Nature | | |
|---|---|---|---|
| | $S_1$ | $S_2$ | $S_3$ |
| $A_1$ | 2500 | 2500 | 2500 |
| $A_2$ | 4000 | 3500 | 2000 |
| $A_3$ | 5000 | 2500 | 1200 |
| Probability of State of Nature | 0.4 | 0.5 | 0.1 |
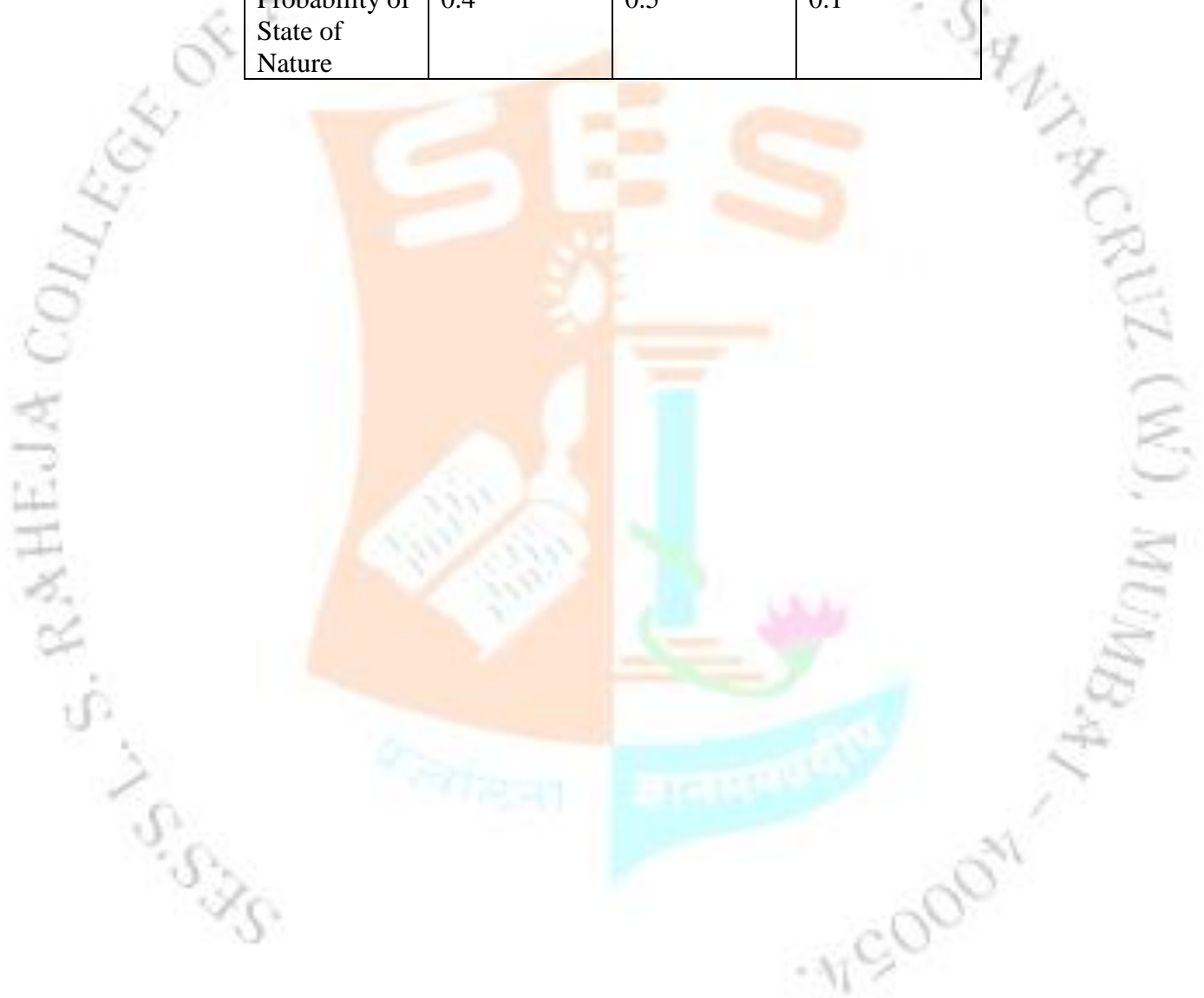
(C) You are given the following payoff table for three acts $A_1$, $A_2$ and the states of nature

$S_1$, $S_2$, $S_3$ .Draw Decision tree.

| Course of Action | State of Nature | | |
|---|---|---|---|
| | $S_1$ | $S_2$ | $S_3$ |
| $A_1$ | 25000 | 35000 | 40000 |
| $A_2$ | 50000 | 20000 | 10000 |
| Probability of State of Nature | 0.3 | 0.5 | 0.2 |

(D) For the past 50 days, the sales from bakery have been as follows.

| Daily Sales | 80 | 100 | 120 |
|---|---|---|---|
| No. of Days | 15 | 25 | 10 |

The bakery's production cost is Rs. 8 per loaf and sales price is Rs. 12 per loaf. The unsold breads are destroyed on the same day. Draw a pay-off table and determine the optimal act using EMV criterion.

(E) A newspaper boy has the following probability distribution of selling a fashion magazine.

| No. of copies Sold | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|
| Probability | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 |

Each magazine cost him Rs. 30 and is sold at Rs. 50. The newspaper boy cannot return the unsold copies. Determine optimum number of copies the newspaper boy should order using EMV criterion.
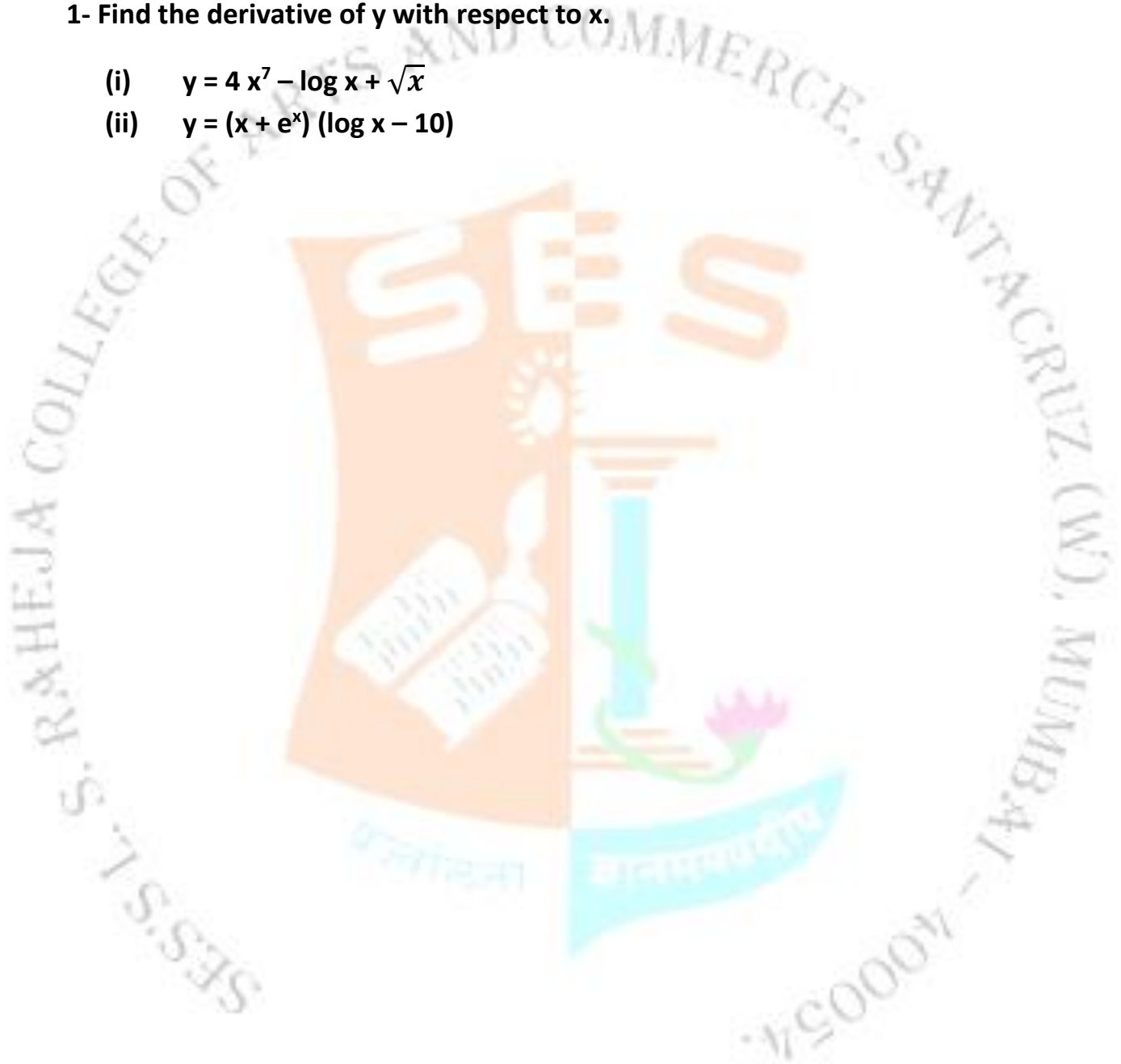
**Unit I : Functions, Derivatives and Their Applications**

**1- Find the derivative of y with respect to x.**

  (i)    $y = 4x^7 - \log x + \sqrt{x}$

  (ii)    $y = (x + e^x)(\log x - 10)$

**2- The total cost function is given by   $C = x^2 + x + 10$.**

**Find the average cost and marginal cost when x is 20.**

**3- Examine the points of maxima and minima for the function**

$f(x) = x^3 - 6x^2 + 9x.$

**4- If the demand function is given by D = 15 – 4p + p².**

**Find the price elasticity of demand when price is 1.**

**5- The demand function function of a commodity is given by p = 18 + D – D²**

**Find the total revenue and marginal revenue function.**

**6- The demand function is D = (p + 3)/((p-1) where D = Price . Find the elasticity of demand when price is 8.**

**7- Differentiate w.r.t x.**

$y = (x+3)^2 (x - 2)$

**Unit II: Interest and Annuity:**

1- A principal amounts to Rs. 11,880/- after 4 years and to 14,040/- after 7 years. Find the principal and the rate of simple interest .

2- Amit keeps a fixed deposit of Rs. 25,000/- in a bank for 3 years . If the rate of interest is 10% per annum compounded annually , find the total amount he will receive at the time of maturity after 3 years.

3- Bhavin promised to pay Ketan Rs. 3,66,025/- after 4 years . If the rate of interest is 12% per annum , find its present worth.

**4-** Find the amount at the end of 1 year of an annuity of Rs. 5,000/- payable at each quarter with rate of interest 12% per annum.

5- Rehan takes a loan of Rs. 30,000/- to be repaid in one year at 9% per annum by reducing balance interest rate. Find the equated monthly instalments (EMI).

Given that $(1.0075)^{12} = 1.0938$

6- A Principal amounts to Rs. 9,680 , after 3 years and to 10,800 after 5 years. Find the principal and rate od simple interest .

**7-** A sum of Rs. 12,000 becomes Rs. 17,280 at 20% compound interest p.a. Find the period.

8- Mr. padwal purchased LCD TV worth Rs. 70,000/- with down payment of Rs. 10,000 and quarterly instalment of equal amount for one year. What is the quarterly instalment if the company wishes to get 12% compound interest ?

9- **Find the final amount of Rs. 10,000 at 9% p.a in 3 years compounded half yearly.**

**UNIT:III  BIVARIATE  LINEAR  CORRELATION  AND  REGRESSION**

**(1)** From  the  following  data  calculate  the  coefficient  of  correlation.
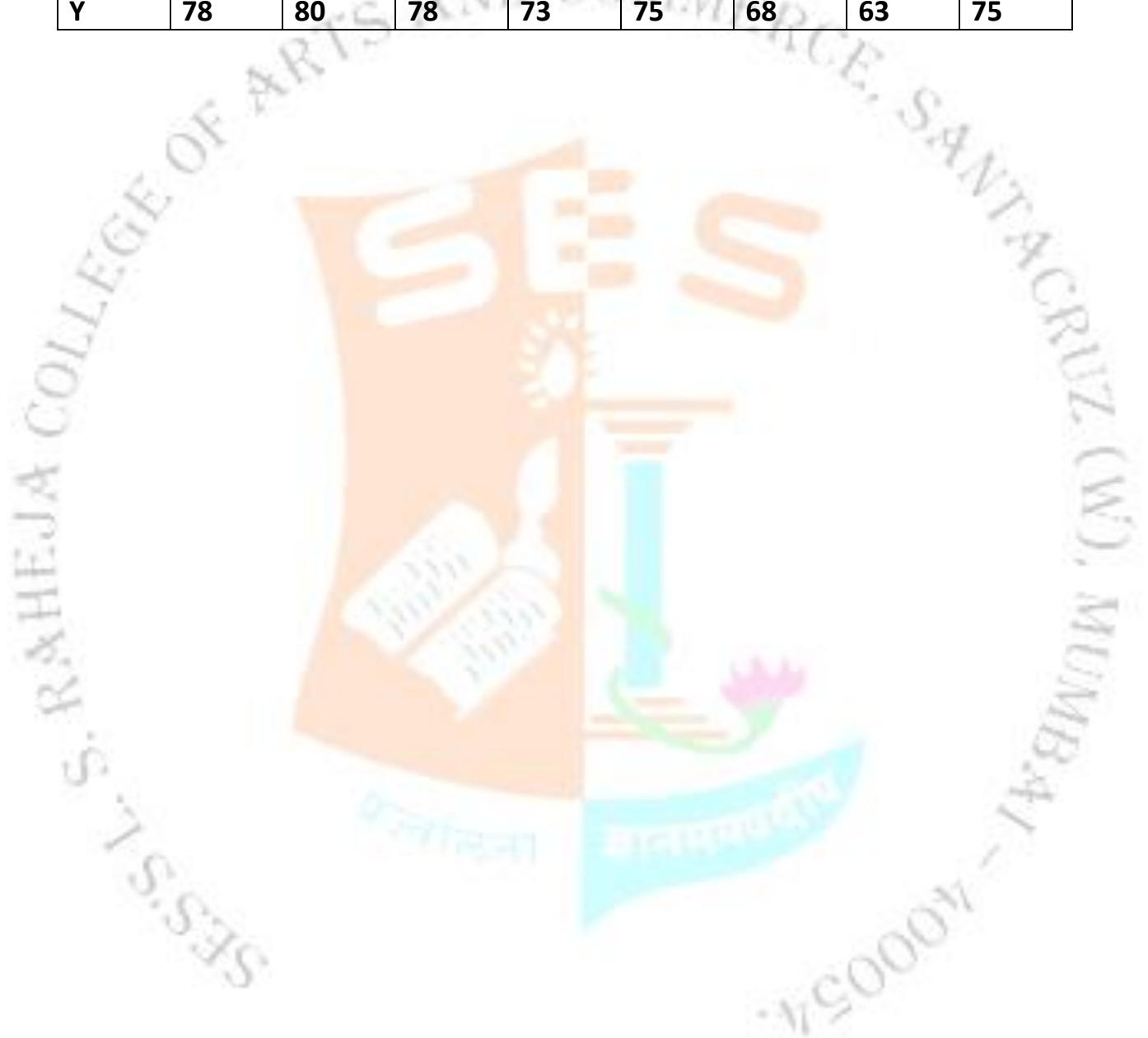
No. of  pairs of  observations  = 12,  sum  of  x  values = 35, sum  of  y  values  =  60,  sum   of  squares  of  x  values  = 148, sum  of  squares  of  y  values = 450,  sum  of  products  of  x   and   y  =  105.

**(2) For the following data of (x) mark in test (y) marks in dancing competition , calculate rank correlation coefficient.**

| X | 67 | 42 | 53 | 67 | 62 | 60 | 54 | 67 |
|---|----|----|----|----|----|----|----|----|
| Y | 78 | 80 | 78 | 73 | 75 | 68 | 63 | 75 |

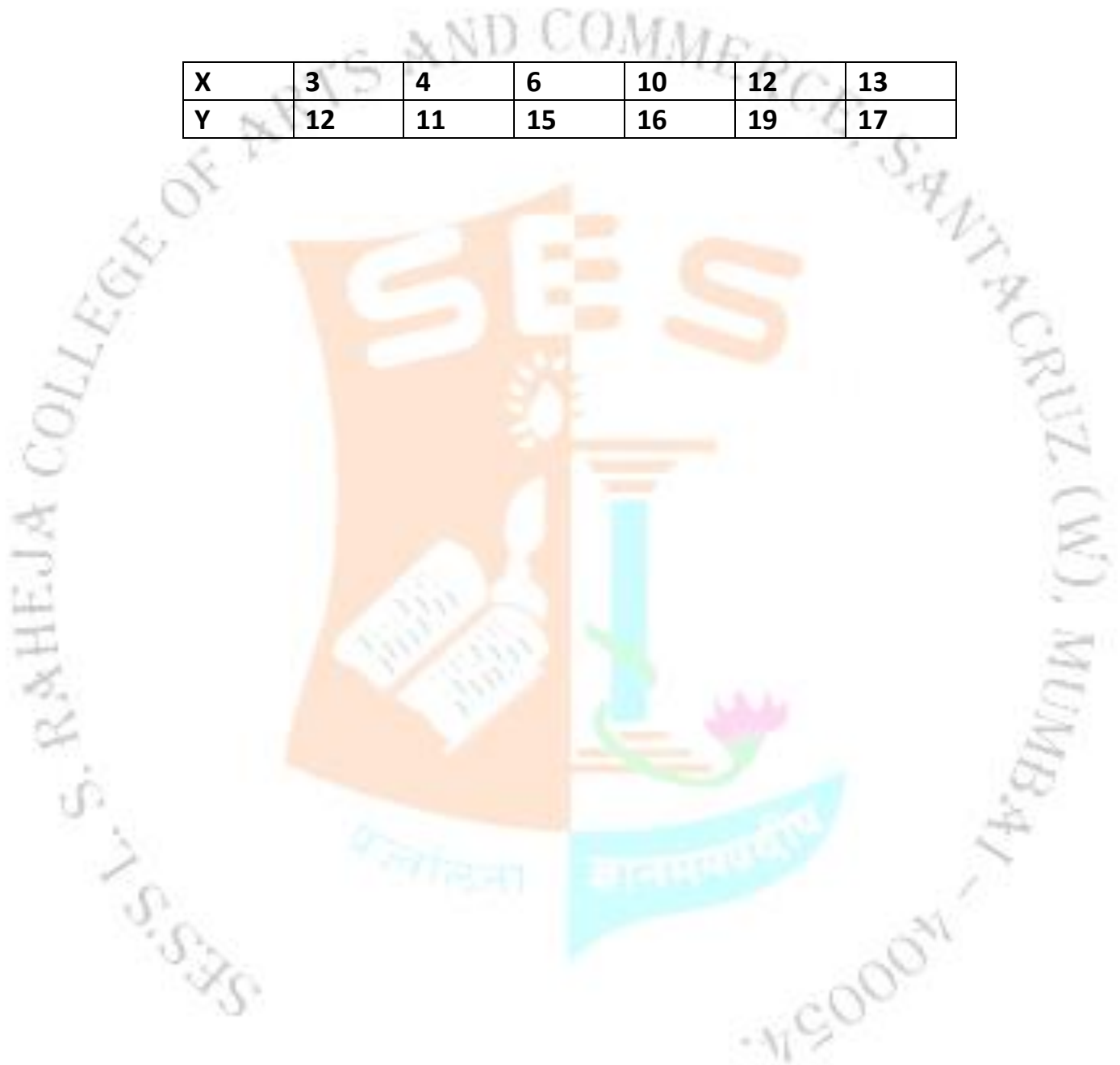**(3)** Calculate the coefficient of correlation using the following data :-

n = 20, $\sum x$ = 260 , $\sum y$ = 450 , $\sum x^2$ = 4720 , $\sum y^2$ = 12230 and $\sum x.y$ = 7050.

**(4) From the following data, find the regression equation of y on x & the regression equation of x on y further estimate y if x = 16 and x if y =18.**

| X | 3 | 4 | 6 | 10 | 12 | 13 |
|---|---|---|---|----|----|----|
| Y | 12 | 11 | 15 | 16 | 19 | 17 |

**(5)** Calculate rank correlation coefficient for the f ollowing data

respectively, marks in Economics (x) and marks in English (y).

| X | 56 | 37 | 65 | 60 | 54 | 51 | 40 | 70 |
|---|----|----|----|----|----|----|----|----|
| Y | 50 | 42 | 55 | 48 | 51 | 53 | 38 | 47 |

(6) Given for 7 pairs of observations $\sum x = 219$, $\sum y = 16.9$,

$\sum x.y = 564.8$, $\sum x = 7364$.Find the regression equation y on x,

**also estimate the value of y when    x = 64.**

**(7)** Given the two regression equations,find (i) mean values of x and y

(ii) coefficient of correlation where the regression equation of y on x is

2x + 3y = 5 and the regression equation of x on y is 5x + 8y = 13

**(8) Given the two regression equations as 4x – y -23 = 0 and 3x -2y + 4 = 0.**

**Find (i) the Mean values of x and y (ii) the coefficient of correlation.**

(9) The  following  data  gives income (x) and savings (y) of  a group of

persons . Estimate  the saving of  a  person  with  income  of  Rs. 900.

| X | 650 | 700 | 500 | 600 | 800 | 1000 | 750 |

| Y | 90 | 100 | 50 | 80 | 110 | 200 | 100 |
|---|----|-----|----|----|-----|-----|-----|

**UNIT:IV          TIME  SERIES  AND  INDEX  NUMBERS**

**(1)** Calculate 3 yearly moving averages for the following time series. Plot the given data and the moving averages on the graph paper.

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|------|------|------|------|------|------|------|------|------|------|
| Time series | 37 | 45 | 52 | 42 | 58 | 63 | 50 | 60 | 34 |

**(2) In the following series of index number shift base from 2000 to 2003.**

| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|------|------|------|------|------|------|------|

| Index | 100 | 105 | 110 | 125 | 135 | 180 |
|-------|-----|-----|-----|-----|-----|-----|

**(3) Calculate 4 yearly moving averages for the following time series. Plot**

the given data and the moving averages on  the graph paper.

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|------|------|------|------|------|------|------|------|------|------|
| Time series | 33 | 41 | 22 | 42 | 18 | 13 | 49 | 45 | 43 |

**(4) Calculate the real income from the following data :-**

| Year | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|
| Income(Rs.) | 6000 | 7000 | 8000 | 9000 | 10,000 |
| Index no. | 150 | 175 | 160 | 180 | 200 |

**(5) Calculate from the following data, the cost of living index number of**

**different Commodity groups.**

| Group | Food | Clothing | Lighting & Fuel | Rent | Misc |
|---|---|---|---|---|---|
| Group Index | 320 | 300 | 250 | 450 | 260 |
| Group Weight | 50 | 10 | 8 | 20 | 12 |

**(6)  From the  following data calculate the cost of living index number for**

**2006 by the family budget method. Also obtain the expenditure of a person in the Year 2006 if his expenditure in 2001 was Rs. 6000/-.**

| Group | Price in 2001 | Price in 2006 | Weight |
|---|---|---|---|
| Food | 15 | 36 | 60 |
| Clothing | 48 | 96 | 5 |
| Lighting & Fuel | 30 | 90 | 10 |
| Rent | 60 | 180 | 15 |
| Miscellaneous | 45 | 90 | 10 |

**(7) If the mean and variance of a Binomial distribution are 4 and 2.4**

**respectively , Find   probability   of  (i) 5  successes        (ii) 8 successes**

**(iii) at  most 3  successes (iv) at  least  9  successes.**

**(8)** It is found that 1.4% of the items in a box of 100 items are defective .

out of  600  boxes , how  many  will  have (i) no  defective  items  (ii) only 1

defective  item ?      ( Given : $e^{-1.4}$ = 0.2466     )

**(9) If X is a normal variate with mean 40 and standard deviation 8, find**

**(i) P( x ≥ 42)**          **(ii) P(x ≤ 39 )**          **(iii) P( 37 ≤ x ≤ 41 )**

**UNIT: V      ELEMENTARY  PROBABILITY  DISTRIBUTIONS**

**(1) If mean and variance of a binomial distribution are 4 and 2 respectively, find probability that no. of successes is (i) only 3 (ii) at most 2 (iii) at least 7 (iv) 3 or 4.**

**(2) If X follows normal distribution with mean 150 and variance 1600,**

**Find** **(i) P(x≤ 166)**

**(ii) P( x≥ 126 )**

**(iii) P( 37 ≤ x ≤ 41 )**

**(3)** If the mean and variance of a Binomial distribution are 4 and 2.4

**respectively ,Find   probability   of        (i) 5   successes        (ii) 8 successes**

**(iii) at   most 3   successes   (iv) at   least   9   successes .**

**(4)** A variate X follows Poisson distribution with parameter 3.

**Evaluate : (i) P( X = 1 )   (ii)P( x $<$ 1 )   (iii) P( x $>$ 1 )**

**( GIVEN :  $e^{-3}$ = 0.0498   )**

**(5)** It is found that 1.4% of the items in a box of 100 items are defective.

out of  600 boxes , how  many  will  have (i) no  defective  items  (ii) only 1

defective  item ?      ( Given : $e^{-1.4}$ = 0.2466    )

**(6)** If  a  fair  coin  is  tossed   6  times , find  the  probability  that  number  of

heads  is    (i) none        (ii) only 2        (iii) all            (iv ) at  least  4.

**(7) Akash receives , on an average , 5 messages per day. Find the**

probability that on a specific day , he will receive (i) only 2 (ii) only 3

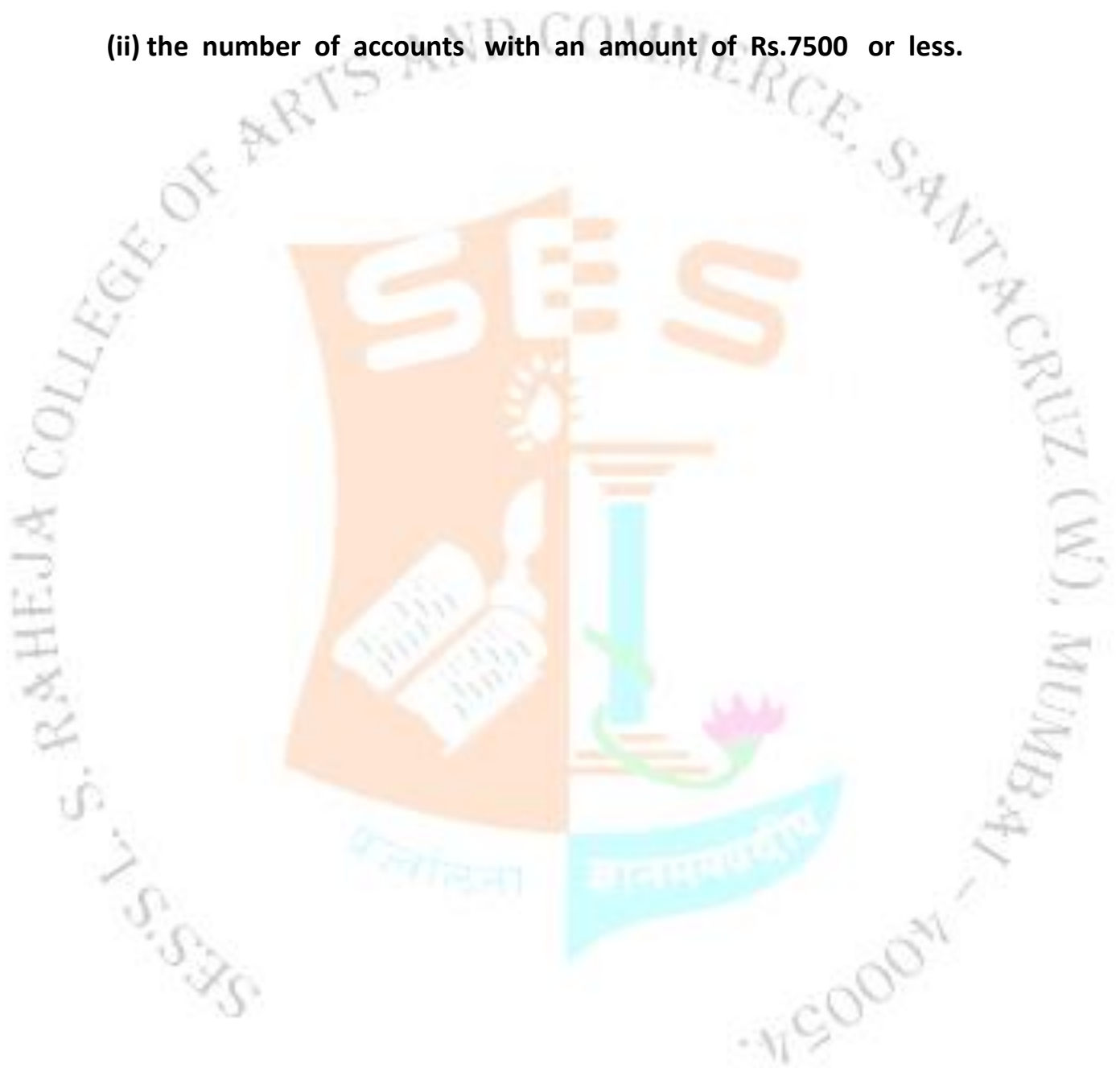(iii) at least 4 (iv) less than 3 messages. (Given : $e^{-5}$ = 0.0067 )

**(8) A firm has 300 accounts which are normally distributed with a mean of**

**Rs. 10,000 and Standard deviation of Rs 1000. Find**

**(i) the number of accounts with amounts lying between Rs.8000 and Rs.11,000.**

**(ii) the number of accounts with an amount of Rs.7500 or less.**

**(9)** If X is a normal variate with mean 40 and standard deviation 8, find

(i) P( x ≥ 42), (ii) P(x ≤ 39 ) (iii) P( 37 ≤ x ≤ 41 )