An Assignment Manual for

Probability & Statistics (3130006)

B.E. Semester 3 (BM, CE, EC, IT)

Institute logo

Directorate of Technical Education,
Gandhinagar, Gujarat

L. D. College of Engineering, Ahmedabad

Certificate

This is to certify that Mr./Ms. _____ _____ Enrollment No. _____ of B.E. Semester _____Branch _____ Engineering of this Institute (GTU Code: _____) has satisfactorily completed the Assignment / Tutorial work for the subject **Probability & Statistics** for the academic year 2023-24.

Place: _____
Date: _____

Name and Sign of Faculty member

Preface

Main objectives of assignment work of any subject is for pleasing to the eye on required skills as well as creating ability amongst students to solve real time problem by developing relevant competencies in psychomotor domain. By keeping in view, GTU has designed competency focused outcome-based curriculum for engineering degree programs where sufficient time given to Assignment or Tutorial work. It shows importance of enhancement of skills amongst the students and it pays attention to utilize every second of time allotted for Assignment or Tutorial work amongst students, faculty members to achieve relevant outcomes by solving the Assignment or Tutorial rather than having simply study type classroom learning. It is must for effective implementation of competency focused outcome-based curriculum that every Assignment or Tutorial work is keenly designed to serve as a tool to develop and enhance relevant competency required by the various branch of engineering among every student. These psychomotor skills are very difficult to develop through traditional chalk and board content delivery method in the classroom. Accordingly, this lab manual is designed to focus on the programme and Course Outcome defined relevant programme, rather than old practice of conducting Assignment or Tutorial to prove concept and theory.

By using this Assignment or Tutorial manual students can go through the relevant theory and numerical in advance which creates an interest and students can have basic practice prior to exam. This in turn enhances pre-determined outcomes amongst students. Each Assignment or Tutorial in this manual begins with understanding, utility, modeling, analytic and creativity other relevant skills, course outcomes as well as practical outcomes (objectives).
This Assignment or Tutorial also provides guidelines to faculty members to facilitate student centric Assignment or Tutorial activities through each Assignment or Tutorial by arranging and managing necessary resources in order that the students follow the procedures with required skill to achieve the outcomes. It also gives an idea that how students will be assessed by process of continuous evaluation system.

Probability and Statistics is a basic science course, which focus on topics like, Experiment, definition of probability, conditional probability, independent events, Bayes' rule, Bernoulli trials, Random variables, discrete random variable, probability mass function, continuous random variable, probability density function, cumulative distribution function, properties of cumulative distribution function, Two dimensional random variables and their distribution functions, Marginal probability function, Independent random variables, Binomial distribution, Poisson distribution, Poisson approximation to the binomial distribution, Normal, Exponential and Gamma densities, Evaluation of statistical parameters for these distributions, Measure of central tendency: Moments, Expectation, dispersion, skewness, kurtosis, expected value of two dimensional random variable, Linear Correlation, correlation coefficient, rank correlation coefficient, Regression, Bounds on probability, Chebyshev's Inequality, Formation of Hypothesis, Test of significance: Large sample test for single proportion, Difference of proportions, Single mean, Difference of means, and Difference of standard deviations, t- Test for single mean, difference of means, t-test for correlation coefficients, F- test for ratio of variances, Chi-square test for goodness of fit and independence of attributes, Curve fitting by the numerical method: Curve fitting by of method of least squares, fitting of straight lines, second degree parabola and more general curves.

Probability & Statistics (3130006)			
CO-PO Matrices			
Table			
Sr. No.	Cos	Statement	
1	1	Understand the terminologies of basic probability, two types of random variables and their probability functions	**20%**
2	2	Observe and analyze the behavior of various discrete and continuous probability distributions	**25%**
3	3	Understand the central tendency, correlation and correlation coefficient and also regression	**20%**
4	4	Apply the statistics for Testing the significance of the given large and small sample data by using t- Test, F- Test and Chi-square Test	**25%**
5	5	Understand the fitting of various curves by method of least square	**10%**

Table CO – PO Matrix

Sr. No.		PO1 Engineering knowledge	PO2 Problem analysis	PO3 Design/ development of solutions	PO4 Conduct investigations of complex problems	PO5 Modern tool usage	PO6 The engineer and society	PO7 Environment and sustainability	PO8 Ethics	PO9 Individual and team work	PO10 Communication	PO11 Project management and finance	PO12 Life-long learning
1	CO1	3	3										
2	CO2	3	3										
3	CO3	3	3										
4	CO4	3	3										
5	CO5	3	3										

Guidelines for Faculty members

1. Teacher should provide the guideline with demonstration some problems to the students.
2. Teacher shall explain in shortly, basic concepts/theory related to the Assignment or Tutorial to the students before starting of each Assignment or Tutorial
3. Involve all the students in Assignment or Tutorial.
4. Teacher is expected to share the skills and competencies to be developed in the students and ensure that the respective skills and competencies are developed in the students after the completion of the Assignment or Tutorial.
5. Teachers should give opportunity to students for hands-on experience after the demonstration.
6. Teacher may provide additional knowledge and skills to the students even though not covered in the manual but are expected from the students.
7. Give assignment and assess the performance of students based on task assigned to check whether it is as per the instructions or not.
8. Teacher is expected to refer complete curriculum of the course and follow the guidelines for implementation.

Instructions for Students

1. Students are expected to carefully listen to all the theory classes delivered by the faculty members and understand the Cos, content of the course, teaching and examination scheme, skill set to be developed etc.
2. Students shall organize the work in the group and make record of all work.
3. Students shall develop maintenance skill as expected by course.
4. Student shall attempt to develop related hand-on skills and build confidence.

5. Student shall develop the habits of evolving more ideas, innovations, skills etc. apart from those included in scope of manual.
6. Student shall refer book and resources.
7. Student should develop a habit of submitting the Assignment or Tutorial work as per the schedule and he/she should be well prepared for the same.

Index
(Progressive Assessment Sheet)

Sr. No.	Objective(s) of Experiment	Page No.	Date of starting	Date of submission	Marks	Sign	Remarks
Total							

	Date:_____
Assignment/Tutorial No: 01	
Topic:	**Basic Probability**:
Sub Topics:	Experiment, definition of probability, conditional probability, independent events,
Relevant CO:	Understand the terminologies of basic probability, two types of random variables and their probability functions
Objectives:	1. **Understand** concept of Experiment, 2. **Definition** of probability, 3. **Evaluate** conditional probability 4. **Define** independent event. 5. **Using** probability theorems to find probability of particular problems.

Sr. No.	Question	CO	PI*	B.T. level
1	Define Mutually exclusive events and independent events. If A and B are independent events, where P(A)=1/4, P(B)=2/3 . Find B)∪P(A	Co1	1.2.2	R, U
2	A card is drawn at random from a pack of 52 cards. **What** is the probability that the card is a spade or a king?	Co1	1.2.2 2.8.1	U, A
3	In a high school graduating class of 100 students, 54 studied mathematics, 69 studied history and 35 studied both mathematics and history. If one of These students is selected at random, **find** the probability that (a) The students took mathematics or history. (b) The students did not take either of these subjects. © The students took history but not mathematics.	Co1	1.2.2 2.8.1	U, A
4	A problem in mathematics is given to three students A, B and C. If the probability of A solving the problem is 1⁄2 and B not solving it is 1⁄4. The whole probability of the problem being solved is 63⁄64 then **what** is the probability of solving it?	Co1	1.2.2 2.8.1	U, A
5	A survey determines that in a locality, 33% go to work by Bike, 42% go by Car, and 12% use both. Find the probability that a random person selected uses neither of them is?	Co1	1.2.2 2.8.1	U, A
6	If 3 balls are "randomly drawn" from a bowl containing 6 white and 5 black balls. **Find** the probability that one of the balls is white and the other two black?	Co1	1.2.2 2.8.1	U, A
7	A problem is given to 5 students P, Q, R, S, T. If the probability of solving the problem individually is 1/2, 1/3, 2/3, 1/5, 1/6 respectively, then **find** the probability that the problem is solved.	Co1	1.2.2 2.8.1	U, A
8	Suppose box A contains 4 red and 5 blue coins and box B contains 6 red and 3 blue coins. A coin is chosen at random from the box A and placed in box B. Finally, a coin is chosen at random from among those now in box B. **What** is the probability a blue coin was transferred from box A to box B given that the coin chosen from box B is red?	Co1	1.2.2 2.8.1	U, A
9	In **how many** different ways can 4 of 15 laboratory assistants be chosen to assist with an experiment?	Co1	1.2.2 2.8.1	U
10	If 3 balls are "randomly drawn" from a bowl containing 6 white and 5 black balls. What is the probability that one of the balls is white and the other two black?	Co1	1.2.2 2.8.1	U

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

PI* **https://www.aicte-india.org/sites/default/files/ExaminationReforms.pdf**

Date:	
Assignment No: 02	
Topic:	Basic Probability:
Sub Topics:	
Relevant CO:	Understand the terminologies of basic probability, two types of random variables and their probability functions
Objectives:	1. Understand concept of **Bayes' theorem.** 2. **Using Bernoulli trials**

Sr. No.	Question	CO	PI	B.T. level
1	A company selected engineers through campus interview from a university. Out of the total selection made 60%, 30% and 10% are from Electronics, Computer and Mechanical respectively. If 9%, 20% and 60% of the selected students do not join the company. What is the probability that do not join is from computer stream.	CO1	1.2.2 2.8.1	U , A
2	Two boxes containing candies re placed on a table. The boxes are labeled B1 and B2. Box B1 contains 7 cinnamon candies and 4 ginger candies. Box B2 contains 3 cinnamon candies and 8 pepper candies. The boxes are arranged so that the probability of selecting box B1 is 1⁄3 and the probability of selecting box B2 is 2⁄3. Suresh is blindfolded and asked to select a candy. He will win a colour TV if he selects a cinnamon candy. What is the probability that Suresh will win the TV (that is, she will select a cinnamon candy)?	CO1	1.2.2 2.8.1	U , A
3	For a certain binary Communication channel, the probability that a transmitted ‘O’ is received as 'O' is 0.95 and the probability that a transmitted '1' is received as '1' is 0.90. If the probability that a 'O' is transmitted is 0.4, find the probability that (a) a '1' is received . (b) a '1' is transmitted given that a '1' is received .	CO1	1.2.2 2.8.1	U , A
4	At a certain university, 4% of men are over 6 feet tall and 1% of women are over 6 feet tall. The total student population is divided in the ratio 3:2 in favor of women. If a student is selected at random from among all those over six feet tall, what is the probability that the student is a woman?	CO1	1.2.2 2.8.1	U , A
5	Three companies A, B and C supply 25%, 35% and 40% of the notebooks to a school. Past experience shows that 5%, 4% and 2% of the notebooks produced by these companies are defective. If a notebook was found to be defective, what is the probability that the notebook was supplied by A?	CO1	1.2.2 2.8.1	U , A
6	State Bayes’ theorem. An urn I contains 3 white and 4 red balls and an urn II contains 5 white and 6 red balls. One ball is drawn at random from one of the urns and is found to be white. Find the probability that it was drawn from urn I.	CO1	1.2.2 2.8.1	R, U , A
7	There are three bags; first containing 1 white, 2 red and 3green balls; second 2 white, 3 red and 1green balls and third 3 white, 1 red and 2 green balls. Two balls are drawn from a beg chosen at random. These are found to be 1 white and 1 red. Find the probability that the balls so drawn came from the second bag.	CO1	1.2.2 2.8.1	U , A
8	An insurance company insured 2000 bike drivers, 4000 car	CO1	1.2.2	U , A

	drivers and 6000 truck drivers. The probability of an accident involving a bike driver, a car driver and a truck driver is 0.10, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a bike driver?		2.8.1	
9	There are two boxes A and B containing 4 white, 3 red and 3 white, 7 red balls respectively. A box is chosen at random and a ball is drawn from it, If the ball is white, find the probability that it is from box A.	CO1	1.2.2 2.8.1	U , A
10	Of three persons the chances that a politician, a businessman, or an academician would be appointed the Vice Chancellor(VC) of a university are 0.5, 0.3, 0.2 respectively. Probabilities that research is promoted by these persons if there are appointed as VC are 0.3, 0.7, 0.8 respectively. (i) **Determine** the probability that research is promoted. (ii) If research is promoted, **what** is the probability that VC is an academician?	CO1	1.2.2 2.8.1	U , A

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 03	
Topic:	Basic Probability:
Sub Topics:	discrete random variable, probability mass function, continuous random variable, probability density function, cumulative distribution function, properties of cumulative distribution function, Two dimensional random variables and their distribution functions, Marginal probability function, Independent random variables.
Relevant CO:	Understand the terminologies of basic probability, two types of random variables and their probability functions
Objectives:	1. Define Random variables 2. Define discrete random variable and Continuous random variable. 3. Using probability mass function and probability density function to calculate probability of various problems. 4. Define Cumulative distribution function and also properties of cumulative distribution function 5. Define two dimensional random variables. Also find their distribution functions. 6. Define Marginal probability function, independent random variables.

Sr. No.	Question	CO	PI	B.T. level
1	**Define** a term random variable and explain different types of random variable.	**CO1**	1.2.2	**R**
2	If X is random variable denoting the sum obtained in rolling a pair of fair dice, **determine** its probability mass function.	**CO1**	1.2.2 2.8.1	U , A
3	**Find** the distribution function for the random variable x where probability density is given by $f(x) = \begin{cases} x\ ;\ for 0 < x < 1 \\ -2x\ ;\ for 1 \le x < 2 \end{cases}$	**CO1**	1.2.2 2.8.1	U , A
4	A random variable X has the following probability distribution: X: 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 P(X): 0 | k | 2k | 2k | 3k | k^2 | $2k^2$ | $7k^2+k$ (a) **Find** k and hence evaluate P(0 < X < 5) (b) **Find** $P\left(\frac{1.5 < X < 4.5}{X > 2}\right)$ (c) Also **find** the E(X).	**CO1**	1.2.2 2.8.1	U , A
5	If X is a continuous random variable with the following probability density function $f(x) = \begin{cases} a\left(2x - x^2\right), 0 < x \le 2 \\ 0\ , \quad x > 2 \end{cases}$ (i) **Find** the value of " a". (ii) **Find** P[X >1].	**CO1**	1.2.2 2.8.1	U , A
6	A random variable X has the following probability distribution Values of X: 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 P(x): a | 3a | 5a | 7a | 9a | 11a | 13a | 15a | 17a (i) **Determine** the value of a. (ii) **Find** P(x<3); p(X ≥ 3), p (0<X<5). (iii) **What** is the smallest value of x for which P($X < x$) > 0.5. (iv) Also **Find** E(X).	**CO1**	1.2.2 2.8.1	U , A
7	The joint distribution function of a random variable (X,Y) is given by	**CO1**	1.2.2 2.8.1	U , A

	$F_{XY}(x, y) = \{(1 - e^{-a\,x})(1 - e^{-b\,y}); x, y \geq 0, a, b > 0$ **Find** (i) Marginal distribution functions of X and Y. (ii) $P(X \leq 2,\ Y \leq 2)$ *and* $P(X \leq 2)$. (iii) Also **show that** X and Y are independent.			
8	The joint probability density function of a bivariate variable (X, Y) is given by $f_{XY}(x, y) = \{k(2x + y);\ 0 < x < 1,\ 0 < y < 1,$ where k is constant. (i) **Find** the value of k. (ii) **Find** the marginal probability density function of X and Y. (iii) Conditional density of X for given Y and use it to **evaluate** $P\left(\frac{X \leq \frac{1}{2}}{Y = 1}\right)$.	**CO1**	1.2.2 2.8.1	U , A
9	The joint probability density function of a bivariate variable (X, Y) is given by $f_{XY}(x, y) = \begin{cases} k(x + y);\ 0 < x < 3,\ 0 < y < 3 \\ 0, \quad \text{otherwise} \end{cases}$ where k is constant. (i) **Find** the value of k. (ii) **Find** the marginal probability density function of X and Y. (iii) Are X and Y independent.	**CO1**	1.2.2 2.8.1	U , A
10	The joint probability mass function of (X , Y) is given by $P_{XY}(x_i, y_j) = \{k\,x_i^2\,y_j^2;\ i = 1, 2;\ j = 1, 2, 3$ (i) **Find** k. (ii) **Find** the marginal probability mass function of X and Y.	**CO1**	1.2.2 2.8.1	U , A
11	If two random variables X and Y have the joint density $f_{XY}(x, y) = \begin{cases} k(x + y^2);\ 0 < x < 1,\ 0 < y < 1 \\ 0, \quad \textit{elsewhere} \end{cases}$ **Find** k and the mean of the conditional density $f(x \mid 0.5)$ where $f_X(x)$ is the marginal probability density of X.	**CO1**	1.2.2 2.8.1	U , A

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 04	
Topic:	**Some special Probability Distributions:**
Sub Topics:	Binomial distribution, Poisson distribution, Poisson approximation to the binomial distribution
Relevant CO:	Observe and analyze the behaviour of various discrete and continuous probability distributions
Objectives:	1. Understand concept of discrete probability distribution 2. Definition of Binomial distribution 3. Evaluation of statistical parameters for binomial distribution 4. Definition of Poisson distribution 5. To prove Poisson approximation to the binomial distribution 6. Evaluation of statistical parameters for Poisson distribution

Sr. No.	Question	CO	PI	B.T. level
1	If 10% if the pens manufactured by the company are defective, **Find** the probability that a box of 12 pens contain (i) Exactly two defective pens (ii) At least two defective pens (iii) No defective pens.	**CO2**	1.2.2 2.8.1	U , A
2	If During a war, one out of 9 ships could not arrive safely. **Find** the probability that exactly 3 out of 6 would arrive safely.	**CO2**	1.2.2 2.8.1	U , A
3	A noisy transmission channel has per digit error probability p = 0.01. **Find** probability of more than one error in 10 received digit using (i) Binomial distribution (ii) Poisson distribution	**CO2**	1.2.2 2.8.1	U , A
4	Letters are received in an office on each one of 100 days. Assuming the following data to form a random sample from a Poisson distribution. **Find** the expected frequencies correct to nearest units. (Given $e^{-4} = 0.0183$) No. of letters (X): 0 1 2 3 4 5 6 7 8 9 10 Frequency(f): 1 4 15 22 21 20 8 6 2 0 1	**CO2**	1.2.2 2.8.1	U , A
5	Out of 800 families with 4 children each how many families would be **expected** to have (i) no girl (ii) at least one boy (iii) 2 boys and 2 girls (iv) at most 2 girls Assume equal probabilities for boys and girls .	**CO2**	1.2.2 2.8.1	U , A
6	Razor blades are supplied by a manufacturing company in packets of 10. There is a probability of 1 in 100 blades to be defective. **Using** Poisson distribution to **calculate** the number of packets containing one defective blade, no defective blade and all defective in a consignment of 10,000 packets.	**CO2**	1.2.2 2.8.1	U , A
7	Each sample of a Chemical used in a textile dying process has a 10% chance of containing a pollutant. **Find** out the probability that in the next 20 samples, contain the pollutant. Assuming that the samples are independent with regard to the presence of the pollutant. To determine the probability that at least four sample contain the pollutant.	**CO2**	1.2.2 2.8.1	U , A
8	The probability that a bomb dropped from a plane will strike the	**CO2**	1.2.2	U , A

<table>
<tr><td></td><td>target is 1/5. If six such bombs are dropped find the probability that at least two will strike the target.</td><td></td><td>2.8.1</td><td></td></tr>
<tr><td>9</td><td>Find the probability that at most 5 defective fuses will be found in a box of 200 fuses. If experience show that 2 percent of such fuses are defective.</td><td>CO2</td><td>1.2.2
2.8.1</td><td>U , A</td></tr>
<tr><td>10</td><td>The following mistakes per page were observed in a book.
<table>
<tr><td>No. of Mistake per page</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>No of Pages</td><td>2</td><td>14</td><td>20</td><td>34</td><td>22</td><td>8</td></tr>
</table>
Fit a Binomial distribution for the given data.</td><td>CO2</td><td>1.2.2
2.8.1</td><td>U , A</td></tr>
<tr><td>11</td><td>With usual notations, find the value of p for a binomial random variable x when n=6 and 9P(x=4)=P(x=2).</td><td>CO2</td><td>1.2.2
2.8.1</td><td>U , A</td></tr>
<tr><td>12</td><td>Prove that Poisson distribution is a limiting case of Binomial distribution.</td><td>CO2</td><td>1.2.2
2.8.1</td><td>U , A</td></tr>
</table>

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 05	
Topic:	**Some special Probability Distributions:**
Sub Topics:	Normal distribution
Relevant CO:	Observe and analyze the behavior of various discrete and continuous probability distributions
Objectives:	1. **Definition Normal distribution** 2. **Evaluation of statistical parameters for normal distribution**

Sr. No.	Question	CO	PI	B.T. level
1	Define Normal distribution. Also write the properties of normal distribution.	CO2	1.2.2	R
2	**Find** the area under the normal curve for (i) z < -1.8 (ii) z > 0.5 (iii) z < 2.3	CO2	1.2.2 2.8.1	U , A
3	If Skulls are classified as A, B, C according as the length and breadth index as under 75, between 75 and 80, or over 80. **Find** the approximately mean and the standard deviation of the classes in which A are 58% , B are 38% and C are 4% given $f(t)=\frac{1}{\sqrt{2\pi}}\int_0^t e^{-t^2/2}dt$ $f(0.20) = 0.08$ and $f(1.75) = 0.46$.	CO2	1.2.2 2.8.1	U , A
4	The distribution of weekly wages for 500 workers in a factory is approximately normal with the mean and standard deviation of Rs. 75 and Rs. 15 respectively. **Find** the number of workers who receive weekly wages (i) more than Rs. 90 (ii) less than Rs. 45.	CO2	1.2.2 2.8.1	U , A
5	If the height of 300 students are normally distributed with mean 64.5 inches and standard deviation 3.3 inches. **How** many students have heights ; (i) less than 5 feet (ii) between 5 feet and 5 feet 9 inches Also find the height below which 99% of the student lie.	CO2	1.2.2 2.8.1	U , A
6	In a normal distribution 31% of the items are under 45 and 8% are over 64. **Find** the parameters of the distribution.	CO2	1.2.2 2.8.1	U , A
7	A manufacturer knows from experience that the resistance of resistors he produces is normal with a mean $\mu = 100$ ohms and standard deviation $\sigma = 2$ ohms. **What** percentage of resistors will have resistance between 98 ohms and 102 ohms?	CO2	1.2.2 2.8.1	U , A
8	State properties of the normal distribution. Suppose the marks of 800 students are normally distributed with mean 66 and standard deviation 5. **Find** number of students getting marks (i) between 65 and 70 (ii) greater than or equal to 72 (Given that P(0 ≤ z ≤ 0.20) = 0.0793, that P(0 ≤ z ≤ 0.80) = 0.2881 and that P(0 ≤ z ≤ 1.2) = 0.3849)	CO2	1.2.2 2.8.1	U , A
9	The probability that an electronic component will fail in less than 1000 hours of continuous use is 0.25. **Use** the normal approximation to **find** the probability that among 200 such components fewer than 45 will fail in less than 1000 hours of continuous use.	CO2	1.2.2 2.8.1	U , A
10	Assume that 5 % of the apples weigh less than 150 gm and 20 % of the apples weigh more than 225 gm. If the distribution of the weight of the apples is normal, **find** the mean and standard deviation of the distribution.	CO2	1.2.2 2.8.1	U , A

11	**Find** the mean and variance for normal distribution.	CO2	1.2.2 2.8.1	U , A

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 06	
Topic:	**Some special Probability Distributions:**
Sub Topics:	Exponential and Gamma densities, Evaluation of statistical parameters for these distributions.
Relevant CO:	Observe and analyze the behavior of various discrete and continuous probability distributions
Objectives:	1. Definition of Exponential distribution 2. Evaluation of statistical parameters for Exponential distribution 3. Definition of Gamma distribution 4. Evaluation of statistical parameters for Gamma distribution

Sr. No.	Question	CO	PI	B.T. level
1	Assume that the length of a phone call in minutes is an exponential with parameter. $\lambda = \frac{1}{10}$. If someone arrives at a phone booth just before you arrive. **Find** the probability that you will have to wait . (i) Less than 5 minutes (ii) between 5 and 10 minutes.	CO2	1.2.2 2.8.1	U , A
2	The time required to repair a machine is exponentially distributed with parameter $\lambda = \frac{1}{2}$. (i) What is the probability that the repair time exceed 2 hrs. (ii) What is the conditional probability that a repair takes at least 10 hrs. Given that its duration exceeds 9 hrs.	CO2	1.2.2 2.8.1	U , A
3	A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as Poisson variate with mean 1.5. **Calculate** the proportion of days on which (1) Neither car is used (2) some demand is refused.	CO2	1.2.2 2.8.1	U , A
4	Define exponential distribution. The average time it takes to serve a customer at a petrol pump is 6 minutes. The service time follows exponential distribution. Calculate the probability that (i) A customer will take less than 2 minutes to complete the service. (ii) A customer will take between 4 and 5 minutes to get the service. (iii) A customer will take more than 10 minutes for his service.	CO2	1.2.2 2.8.1	U , A
5	How exponential distribution is useful in real applications? Find the mean and variance of the exponential distribution $f(x) = \begin{cases} \frac{1}{\beta} e^{-x/\beta} , & x > 0 , \quad \beta > 0. \\ 0 , & otherwise \end{cases}$	CO2	1.2.2 2.8.1	U , A
6	Define Gamma distribution. Given a Gamma random variable X with r = 3 and $\lambda = 2$. Compute E(X), Var(X) and P(X ≤ 1.5).	CO2	1.2.2 2.8.1	U , A
7	If a random variable x is Gamma distribution with parameter λ = 3, compute the value of (i) P(x≤1) and (ii) P(1≤x≤2).	CO2	1.2.2 2.8.1	U , A
8	In a certain city, the daily consumption of electric power (in millions of kilowatt hours) can be treated as a random variable having a gamma distribution with α = 2 and β = 3. If the power plant of this city has a daily capacity of 12 million kilowatt-	CO2	1.2.2 2.8.1	U , A

	hours, what is the probability that this power supply will be inadequate on any given day? Also, find the mean of this probability density.			
9	**Show** that for the exponential distribution given by $dp = a e^{-x/c}$, $0 \le x \le \infty$, $c > 0$, a being a constant, the mean and standard deviation are each equal to c.	CO2	1.2.2 2.8.1	U , A
10	Suppose that the time it takes to get service in a restaurant follows a gamma distribution with mean 8 minutes and variance 32 minutes. Suppose that you went to this restaurant at 6: 30 p.m. What is the probability that you will receive service before 6: 36 p.m.?	CO2	1.2.2 2.8.1	U , A

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 07	
Topic:	**Basic Statistics:**
Sub Topics:	Measure of central tendency, mean , mode, median, mean deviation, standard deviation and quartile deviation, moment.
Relevant CO:	Understand the central tendency, correlation and correlation coefficient and also regression
Objectives:	1. Measure of central tendency 2. Find Mean, Mode and Median for given data. 3. Calculate mean deviation, standard deviation and quartile deviation. 4. Calculate moment about origin, about any point and about mean.

Sr. No.	Question	CO	PI	B.T. level
1	**Find** the mean, median and Mode for the following frequency distribution x: 1 2 3 4 5 6 7 8 9 10 f: 4 7 8 10 6 6 4 2 2 1	Co3	1.2.2 2.8.1	U , A
2	The following are the marks obtained by 10 students in Mathematics. **Find** the average marks. Roll no: 1 2 3 4 5 6 7 8 9 10 Marks: 48 65 43 31 57 37 60 59 49 77	Co3	1.2.2 2.8.1	U , A
3	The Arithmetic mean of the following frequency distribution is 34 marks. **Determine** the missing frequency. Marks: 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 No. of students: 5 | 15 | 20 | a | 20 | 10	Co3	1.2.2 2.8.1	U , A
4	An insurance company obtained the following data for accident claims (in thousand rupees) from a particular region. **Find** its mean, median and Mode. Amount: 1-3 | 3-5 | 5-7 | 7-9 | 9-11 | 11-13 Frequency: 6 | 47 | 75 | 46 | 18 | 8	Co3	1.2.2 2.8.1	U , A
5	**Compute** mean deviation and standard deviation for the data Size of the item: 6 7 8 9 10 11 12 frequency: 3 6 9 13 8 5 4	Co3	1.2.2 2.8.1	U , A
6	**Compute** quartile deviation and mean deviation for the following data. Class: 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 Frequency: 2 | 12 | 27 | 45 | 30 | 18	Co3	1.2.2 2.8.1	U , A
7	**Find** the quartile deviation for the following distribution. Class: 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-8 frequency: 2 | 5 | 7 | 13 | 21 | 16 | 8 | 3	Co3	1.2.2 2.8.1	U , A
8	The first four moments of a distribution about the value 4 of the variable are -1.5, 17, -30 and 108. **Find** the moments about the mean β_1, β_2 and comment on their values. Also find the moment about the point x = 2.	Co3	1.2.2 2.8.1	U , A
9	**Calculate** the first four moments of the following distribution about a = 40.5 and hence find the moments about the mean of distribution:	Co3	1.2.2 2.8.1	U , A

		Hours worked	30-32.9	33-35.9	36-38.9	39-41.9	42-44.9	45-47.9			
		No. of Industries	2	4	26	47	15	6			
10	**Find** the first four moments (a) about the origin (b) about the mean for a random variable x having density function $$f(x)\begin{cases}\frac{4x(9-x^2)}{81}; & 0 \le x \le 3\\ 0 \quad\quad\quad ; & otherwise\end{cases}$$								Co3	1.2.2 2.8.1	U , A

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 08	
Topic:	**Basic Statistics:**
Sub Topics:	Expectation, dispersion, skewness, kurtosis
Relevant CO:	Understand the central tendency, correlation and correlation coefficient and also regression
Objectives:	1. Find Expectation for the given data. 2. Find dispersion and skewness for given data. 3. Using moment to calculate skewness and kurtosis.

Sr. No.	Question	CO	PI	B.T. level
1	A man draws 2 balls from a bag containing 3 white and 5 black balls. If he is to receive Rs. 50 for every white ball he draws and Rs. 20 for every black ball. Find his expectation.	Co3	1.2.2 2.8.1	U , A
2	For a distribution of 250 heights, calculations showed that the mean, standard deviation β_1 *and* β_2 were 54 inches, 3 inches, 0 inches and 3 inches. It was however, discovered on checking that two items 64 and 50 in the original data were wrongly written in place of the correct values 62 and 52 inches respectively. **Calculate** the correct frequency constant.	Co3	1.2.2 2.8.1	U , A
3	For a group of 10 items, $\sum x = 452$, $\sum x^2 = 24270$ *and* $\text{mod}\, e = 43.7$. **Find** Karl Pearson's coefficient of skewness.	Co3	1.2.2 2.8.1	U , A
4	**Calculate** the Bowley's coefficient of skewness for the following data. Class interval: 0-10 | 10-20 | 20-30 | 30-40 | 40-50 Frequency: 10 | 14 | 19 | 17 | 13	Co3	1.2.2 2.8.1	U , A
5	In a distribution, the mean = 65, median = 70, coefficient of skewness = - 0.6. **Find** the mode and coefficient of variation.	Co3	1.2.2 2.8.1	U , A
6	**Compute** the coefficient of skewness by using Karl Pearson and Bowley's method for the following data. Class interval: 0-2 | 2-4 | 4-6 | 6-8 | 8-10 Frequency: 5 | 18 | 42 | 27 | 8	Co3	1.2.2 2.8.1	U , A
7	A random variable X has a following p. d. f. $\left\{\frac{1}{2}x;\ 0 < x < 2\right.$ Find (i) E(X) (ii) V(x) (iii) $E\left(3X^2 - 2X\right)$	Co3	1.2.2 2.8.1	U , A
8	A and B throw an ordinary die alternately for a stake of Rs. 11, which is to be won by one who first 6. Find their expectations, if A has the first chance.	Co3	1.2.2 2.8.1	U , A
9	A person draws cards one by one from a pack until he draws all the aces. How many cards he may be expected to draw?	Co3	1.2.2 2.8.1	U , A
10	Let X be a random variable with E(X)= 10 and V(X)= 25. Find the positive values of a and b such that Y = Ax – b has an expectation of 0 and variance of 1.	Co3	1.2.2 2.8.1	U , A

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 09	
Topic:	**Basic Statistics:**
Sub Topics:	Expected value of two dimensional random variable, Linear Correlation, correlation coefficient, rank correlation coefficient, Regression, Bounds on probability, Chebyshev's Inequality
Relevant CO:	Understand the central tendency, correlation and correlation coefficient and also regression
Objectives:	1. Calculate Correlation and Rank Correlation for given data. 2. Find regression line for given data. 3. Define the Chebyshev's inequality and use it to solve problems.

Sr. No.	Question	CO	PI	B.T. level
1	**Calculate** the Karl Pearson's coefficient of correlation of the following data:- X: 25, 27, 30, 35, 33, 28, 36 Y: 19, 22, 27, 28, 30, 23, 28	Co3	1.2.2 2.8.1	U, A
2	**Calculate** the correlation coefficient for the following height (in inches) of fathers (X) and their son(Y): X: 65, 66, 67, 67, 68, 69, 70, 72 Y: 67, 68, 65, 68, 72, 72, 69, 71	Co3	1.2.2 2.8.1	U, A
3	**Prove** that the correlation coefficient lies between – 1 and + 1.	Co3	1.2.2 2.8.1	U, A
4	**Calculate** the rank correlation coefficient for given data X: 12, 15, 18, 20, 16, 15, 18, 22, 15, 21, 18, 15 Y: 10, 18, 19, 12, 15, 19, 17, 19, 16, 14, 13, 17	Co3	1.2.2 2.8.1	U, A
5	The ranks of same 16 students in Mathematics and Physics are as follows. Two numbers within brackets denote the ranks of the students in Mathematics and Physics. (1,1), (2,10), (3,3), (4,4), (5,5), (6,7), (7,2), (8,6), (9,8), (10,11), (11,15), (12,9), (13,14), (14,12), (15,16), (16,13). **Calculate** the rank correlation coefficient for proficiencies of this group in Mathematics and Physics	Co3	1.2.2 2.8.1	U, A
6	**Calculate** the coefficient of correlation and obtain the line of regression for the following data. X: 1, 2, 3, 4, 5, 6, 7, 8, 9 y: 9, 8, 10, 12, 11, 13, 14, 16, 15 **Obtain** also an estimate for y which should correspond on an average to x = 6.2.	Co3	1.2.2 2.8.1	U, A
7	In a partially destroyed laboratory on record of an analysis of correlation data the following results only are legible, Var x = 9, Regression equations : $8x - 10y + 66 = 0$, $40x - 18y = 214$ **Find** : (i) The mean value of x and y (ii) The standard deviation of y (iii)The coefficient of correlation between x and y .	Co3	1.2.2 2.8.1	U, A
8	**Show that** θ, the acute angle between the two lines of regression is given by	Co3	1.2.2 2.8.1	U, A

	$\tan\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma_x\sigma_y}{\sigma_{x^2}+\sigma_{y^2}}\right)$ Interpret the case when r = 0, $\pm$ 1			
9	**Find** the most likely price in Bombay corresponding to the price of Rs.70 at Calcutta from the following: Calcutta Bombay Average price 65 67 Standard deviation 2.5 3.5 Correlation coefficient between the prices of commodities in the two cities is 0.8.	Co3	1.2.2 2.8.1	U, A
10	**Find** the two lines of regression and coefficient of correlation for the data given below. $n = 18, \sum x = 12, \sum y = 18, \sum x^2 = 60, \sum y^2 = 96, \sum xy = 48.$	Co3	1.2.2 2.8.1	U, A
11	**Obtain** the regression line of y on x for the following data: X: 100, 98, 78, 85, 110, 93, 80 y: 85, 90, 70, 72, 95, 81, 74	Co3	1.2.2 2.8.1	U, A
12	State Chebyshev's inequality. A fair dice is tossed 120 times. Use Chebyshev's inequality to find a lower bound for the probability of getting 80 to 120 sixes.	Co3	1.2.2 2.8.1	U, A

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 10	
Topic:	**APPLIED STATISTICS**
Sub Topics:	Formation of Hypothesis, **Test** of significance: Large sample **Test** for single proportion, Difference of proportions, Single mean, Difference of means, and Difference of standard deviations
Relevant CO:	Apply the statistics for **Test**ing the significance of the given large and small sample data by using t- **Test**, F- **Test** and Chi-square **Test**
Objectives:	1. Understand concept of Hypothesis 2. **Test** of significance for Large sample for single proportion & difference of proportions 3. **Test** of significance for Large sample for single mean & difference of means 4. **Test** of significance for Large sample for difference of standard deviations

Sr. No.	Question	CO	PI	B.T. level
1	Explain the term related to testing of hypothesis (i) Null hypothesis (ii) Level of significance (iii) Two tailed test.	Co4	1.2.2	R
2	Twenty people were attacked by disease and only 18 survived. Will you reject the hypothesis that the survival rate, if attacked by this disease is 85% in favor of the hypothesis that it is more at 5% level. (use large sample **Test**)		1.2.2 2.8.4	U, A
3	A cigarette manufacturing firm claims that its brand A of the cigarettes outsells its brand B by 8%. If it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another random sample of 100 smokers prefer brand B, **Test** whether the 8% difference is a valid claim. (use 5% LOS)	Co4	1.2.2 2.8.4	U, A
4	In a year there are 956 births in a town A, of which 52.5% were males, while in towns A and B combined this proportion in a total of 140.6 births was 0.496. Is there any significant difference in the proportion of male births in the two towns?	Co4	1.2.2 2.8.4	U, A
5	In a large population, there are 30% and 25% respectively of blue eyed people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations.	Co4	1.2.2 2.8.4	U , A
6	The mean breaking strength of the cables supplied by a manufacturer is 1800 with SD of 100. By a new technique in the manufacturing process, it is claimed that the breaking strength of the cable has increased. To **Test** this claim, a sample of 50 cables is **Test**ed and it is found that the mean breaking strength is 1850. Can we support the claim at 1% LOS.	Co4	1.2.2 2.8.4	U, A
7	A sample of 900 members has a mean 3.4cms and s.d. 2.61 cms. Is the sample from a large population of mean 3.25 cms and 2.61 cms. If the population is normal and the mean is unknown **Find** the 95% and 98% fiducially limits of true mean.	Co4	1.2.2 2.8.4	U, A
8	Before an increase in excise duty on tea, 800 persons out of a sample 1000 persons were found to be tea drinkers. After an increase in duty, 800 people were tea drinkers in sample 1200 using standard error of proportion, state whether there is a significant decrease in the consumption of tea after the increase in excise duty.	Co4	1.2.2 2.8.4	U, A
9	The means of two single large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of	Co4	1.2.2 2.8.4	U, A

	standard deviation 2.5 inches.(**Test** at 5% LOS)			
10	In a random sample of 400 persons from a large population 120 are females. Can it be said that males and females are in the ratio 5:3 in population? Use 1% level of significance.	Co4	1.2.2 2.8.4	U, A
11	Intelligence **Test**s were are given to groups of boys and girls . Examine if the difference between mean scores is significant at 5% LOS.	Co4	1.2.2 2.8.4	U, A
12	The mean of 35 sample of the thermal conductivity of a certain kind of cement brick is 0.343 with standard deviation of 0.010. Test the hypothesis that the population mean is 0.340 at 5% level of significance	Co4	1.2.2 2.8.4	U , A
13	A tire company is suspicious to claim that the average lifetime of certain tires is at least 28000 km. To check the claim, the company takes the sample of 40 tires and gets a mean life time of 27463 km with standard deviation of 1348 km. Test the hypothesis at 1% level of significance.	Co4	1.2.2 2.8.4	U, A
14	A stenographer claims that she can type at the rate of 120 words per minute. She demonstrated, on the basis of 100 trials, an average speed of 116 words with a standard deviation of 15 words. Does this enable us to reject the null hypothesis $\mu = 120$ against the alternative hypothesis $\mu < 120$ at the 0.05 level of significance?	Co4	1.2.2 2.8.4	U, A
15	Ten bearings made by a certain process have a mean diameter of 0.506 cm and a standard deviation of 0.004 cm. Assuming that the data may be looked upon as a random variable from a normal population, construct a 95 % confidence interval for the actual average diameter of bearings made by this process	Co4	1.2.2 2.8.4	U , A
16	The dean of a college wants to use the mean of a random sample to estimate the average amount of time students take to get from one class to the next, and she wants to be able to assert with 99 % confidence that the error is at most 0.25 minute. If it can be presumed from experience that $\sigma = 1.40$ minutes, how large a sample will she have to take?	Co4	1.2.2 2.8.4	U, A
17	A normal population has mean of 6.8 and standard deviation of 1.5. A sample of 400 members gave a mean of 6.75. Is the difference significant at LOS 5%. (large sample **Test**)	Co4	1.2.2 2.8.4	U, A
18	In two large populations , there are 30% and 25%, respectively, of haired people. Is this **difference** likely to be hidden in sample of 1200 and 900, respectively, from the two populations at 5% and 1% LOS? (large sample **Test**)	Co4	1.2.2 2.8.4	U, A
19	Random sample are drawn from two countries gave the following data relating to the heights of adult males: (i) Is the **difference** between means significant?	Co4	1.2.2 2.8.4	U, A

	Mean	Standard Deviation	Size
Girls	75	8	60
Boys	73	10	100

	Mean	Standard Deviation	Size
A	67.42	2.58	1000
B	67.25	2.50	1200

	(ii) Is the **difference** between standard deviations? (At 5% LOS)			

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 11	
Topic:	**APPLIED STATISTICS**
Sub Topics:	Test of significance for small samples: t- test for single mean, t-test for difference of means, t-test for correlation coefficients.
Relevant CO:	Apply the statistics for **Test**ing the significance of the given large and small sample data by using t- **Test**, F- **Test** and Chi-square **Test**
Objectives:	1. Test of significance for small samples using t- test for single mean 2. Using t-test for difference of means, t-test for correlation coefficients

Sr. No.	Question	CO	PI	B.T. level
1	A mechanist is making engine parts with axle diameters 0.700". A random sample of 10 parts shows a mean diameter of 0.742" with a SD of 0.04". **Test** whether work is meeting the specification.	Co4	1.2.2 2.8.4	U, A
2	Show that the 95% fiducially limits for the mean μ of the population are $x \pm \frac{St_{0.05}}{\sqrt{n}}$. Deduce that for a random sample of 16 values with mean 41.5" and the sum of the squares of the deviations from the mean 135 (inches)^2 and drawn from a normal population, 95% fiducially limits for the mean of the population are 39.9" and 43.1".	Co4	1.2.2 2.8.4	U, A
3	The heights of 10 males of a given locality are found to be 175, 168, 155, 170, 152, 170, 175, 160, 160 and 165 cm. Based on this sample, **Find** the 95% confidence limits for the height of males in that locality.	Co4	1.2.2 2.8.4	U, A
4	Two horses A and B were **Test**ed according to the time (in seconds) to run a particular track with the following result: Horse A : 28, 30, 32, 33, 33, 29, 34 Horse B : 29, 30, 30, 24, 27, 29 **Test** whether you can discriminate between the two horses. You can use the fact that 5% value of t for 11 d. f. is 2.20.	Co4	1.2.2 2.8.4	U, A
5	For a random sample of 10 pigs, fed the diet A, the increases in weight in a certain period were 10, 6, 16, 17, 13, 12, 8, 14, 15, 9 lbs. For another random sample of 12 pigs, fed on diet B, the increases in the same period were 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17 lbs. These whether the diets A and B differ significantly as regards the effect on increase in weight (or **Test** whether the mean increases in the two sample as significantly different). Use the fact that 5% value of t for 20 d. f. is 2.09.	Co4	1.2.2 2.8.4	U, A
6	In a certain experiment to compare two types of pig-foods A and B, the following result of increase in weights were observed in pigs : Pig No. 1 2 3 4 5 6 7 8 Wt. in kg. Food A 49 53 51 52 47 50 52 53 Wt. in kg. Food B 52 55 52 53 50 54 54 53 (a) Assuming that two samples of pigs are independent can we conclude that found B is better than food A?	Co4	1.2.2 2.8.4	U, A

	(b) Examine the case when the same set of eight pigs were used in both the foods.			
7	A random sample of size 15 from bivariate normal distribution gave a correlation coefficient r=0.5. Is this indicate the existence of correlation in the population?	Co4	1.2.2 2.8.4	U, A
8	A random sample from a company's very extensive files shows that orders for a certain piece of machinery were filled, respectively, in 10, 12, 19, 14, 15, 18, 11 and 13 days. Use the level of significance α = 0.01 to test the claim that on average such orders are filled in 10.5 days. Choose the alternative hypothesis so that rejection of the null hypothesis μ = 10.5 implies that it takes longer than indicated. Assume normality.	Co4	1.2.2 2.8.4	U, A
9	Manager of a diet plan advertise that the mean weight loss for people on their plan is at least 45 pounds in 6 months. A sample of 28 people on this plan loses an average of 35 pounds with standard deviation of 20 pounds. **Test** at 1% level of significance.	Co4	1.2.2 2.8.4	U, A
10	It is known that the mean diameters of rivets produced by two firms A and B practically the same but their SD may differ. For 22 rivets manufactured by B the SD is 3.8. **Test** whether the products of A have the same variability as those of B.	Co4	1.2.2 2.8.4	U, A
11	The nicotine contents in two random samples of tobacco are given below : Sample 1 : 21 24 25 26 27 Sample 2 : 22 27 28 30 31 36 Can you say that the two samples came from the same population?	Co4	1.2.2 2.8.4	U , A
12	The correlation coefficient between income and food expenditure for sample of 7 house hold from a low income group is 0.9. Using 1% level of significance, **Test** whether the correlation coefficient between incomes and food expenditure is positive. Assume that the population of both variables is normally distributed.	Co4	1.2.2 2.8.4	U , A
13	A random sample of fifteen paired observations from a bivariate normal population gives a correlation coefficient of -0.5. Dose this existence of correlation in the sampled population? (**Test** at 5% level of significance)	Co4	1.2.2 2.8.4	U , A
14	The mean weight loss of 16=n grinding balls after a certain length of time in millslurry is 3.42 grams with a standard deviation of 0.68 grams. Construct a 99% confidence interval for the true mean weight loss of such grinding balls under the stated conditions. (for v = 15, $t_{0.005}$ = 2.947)	Co4	1.2.2 2.8.4	U , A

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 12	
Topic:	**APPLIED STATISTICS**
Sub Topics:	Large samples and Small sample
Relevant CO:	Apply the statistics for **Test**ing the significance of the given large and small sample data by using t- **Test**, F- **Test** and Chi-square **Test**
Objectives:	1. Using Chi-square test for goodness of fit. 2. **Test**ing the significance by using F-test.

Sr. No.	Question	CO	PI	B.T. level
1	The following table showing the number of plants having certain characters. **Use** the χ^2 test to access the correctness of the hypothesis that the flower colour is independent of flatness of leaf at 5% level of significance.	Co4	1.2.2 2.8.4	U, A
2	The mean life of a sample of 25 fluorescent light bulbs is found as 1550 hours with a standard deviation of 120 hours. The company manufacturing the bulbs claims that the average life of their bulbs is 1600 hours. Is the claim acceptance at 5% level of significance? The value of t at 5% level of significance and 24 degree of freedom is 1.711.	Co4	1.2.2 2.8.4	U, A
3	The mean life time of sample of 100 fluorescent light bulbs produced by a company is computed to be 1570 hours with a standard deviation of 120 hours. The company claims that the average life of the bulbs produced by it is 1600 hours. Using the level of significance of 0.05, is the claim acceptable? (1.96).	Co4	1.2.2 2.8.4	U, A
4	Children having one parent of blood type M and the other type N will always be one of the three types M, MN, N and average proportion of these will be 1 : 2 : 1. Out of 300 children of above parents, 30% are of group M, 45% of group MN and rest are of group N. (Use Chi-square test)	Co4	1.2.2 2.8.4	U, A
5	**Test** the hypothesis at 5% level of significance that the presence or absence of hypertension (HT) is independent of smoking habits from the following data of 180 persons.	Co4	1.2.2 2.8.4	U, A
6	There are two different choices to stimulate a certain chemical process. To **Test** whether the variance of the yield is the same no matter which catalyst is used. A sample of 10 batches is produced using the first catalyst and of 11 using the second. If the resulting data is $s_1^2 = 0.14$ *and* $s_2^2 = 0.28$. **Test** the hypothesis of equal variance at 2% level. (F-**Test**)	Co4	1.2.2 2.8.4	U, A
7	For the following two independent samples of any problem, **Test**	Co4	1.2.2	U, A

	Flat leaves	Curled leaves	Total
White flowers	267	27	294
Red flowers	757	155	912
Total	1024	182	1206

	Non smokers	Moderate smokers	Heavy smokers
HT	21	36	30
No HT	48	26	19

										2.8.4	
	X	15.0	8.0	3.8	6.4	27.4	19.0	35.3	13.6		
	y	18.8	23.1	10.3	8.0	18.0	10.2	15.2	19.0	20.2	
	the equality of variance at 10% level of significance. (Using F-**Test**)										
8	Two random samples gave the following data: Size Mean Variance Sample I 8 9.6 1.2 Sample II 11 16.5 2.5 Can we **conclude** that the two samples have been drawn from the same normal population? $F_{0.05,(10,7)} = 3.64$.									Co4	1.2.2 2.8.4	U, A
9	12 dice were thrown 4096 times and a throw of 6 was reckoned as a success; the observed frequencies were given below :									Co4	1.2.2 2.8.4	U, A
	No. of successes :	0	1	2	3	4	5	6	7 & above			
	Frequencies	447	1145	1181	796	380	115	24	8			
	Find the value of chi-square on the basis of the hypothesis that the dice were unbiased and hence show that the data are consistent with the hypothesis so far as the χ^2 – test is concerned. The value of χ^2 for 7 degrees of freedom at 5% level of significance is 14.067.											
10	The following table gives the number of aircraft accidents that occurred during the various days of the week. **Test** whether the accidents are uniformly distributed over the week:									Co4	1.2.2 2.8.4	U, A
	Days :	Mon	Tue	Wed	Thu	Fri	Sat					
	No. of accidents	14	18	12	11	15	14					
11	Fit a binomial distribution for the following data showing the survey of 800 families with 4 children and test the goodness of fit.									Co4	1.2.2 2.8.4	U , A
	No. of boys	0	1	2	3	4						
	No. of girls	4	3	2	1	0						
	No. of families	32	178	290	238	64						

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 13	
Topic:	Curve fitting by the numerical method
Sub Topics:	Least square Method and Fitting of straight lines.
Relevant CO:	Understand the fitting of various curves by method of least square
Objectives:	1. Understand Curve fitting by the numerical method. 2. To fit a straight line by method of least square.

Sr. No.	Question	CO	PI	B.T. level
1	**Find** the best-fit values of a and b so that y =a+ bx fits the data given in the table. x: 0, 1, 2, 3, 4 y: 1, 1.8, 3.3, 4.5, 6.3	Co5	1.2.1	U, A
2	**Apply** the method of Least square to fit straight line y = a+ bx to the following set of observations. Also, estimate the value of y at x=72. x: 65, 66, 67, 67, 68, 69, 71, 73 y: 67, 68, 64, 68, 72, 70, 69, 70	Co5	1.2.1	U, A
3	Fit a straight line y =a+ bx for the following data : x : 1, 2, 3, 4, 5, 6, 7, 8, 9 y : 2, 6, 7, 8, 10, 11, 11, 10, 9 also **Find** difference between the actual value of y and the value of y obtained from the fitted curve in each case when x = 5.	Co5	1.2.1	U, A
4	In a tensile of a metal bar the following observation were made; where x represent the load in tones and y the elongation in thousandth of millimetres: x: 1, 2, 3, 4, 5 y: 35, 68, 100, 138, 170 **Determine** a linear relation expressing y in terms of x by the method of least squares	Co5	1.2.1	U, A
5	**Explain** the method of least squares. **Apply** the method of Least square to fit straight line to the following set of observations X: 1, 1.5, 2, 2.5, 3, 3.5, 4 Y: 1.1, 1.3, 1.6, 2, 2.7, 3.4, 4.1	Co5	1.2.1	U, A
6	**Find** the best-fit values of a and b so that y =a+ bx fits the data given in the table x: 0, 1, 2, 3, 4 y: 1, 1.8, 1.3, 2.5, 6.3	Co5	1.2.1	U, A
7	**Apply** the method of Least square to fit straight line y =a+ bx to the following set of observations x: 1, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0 y: 1.1, 1.3, 1.6, 2.6, 2.7, 3.4, 4.1	Co5	1.2.1	U, A
8	**Apply** the method of Least square to fit straight line y =a+ bx to the following set of observations x : 0, 1, 2, 3, 4 y : 1, 1.0, 1.3, 2.5, 6.3	Co5	1.2.1	U, A
9	The following show the gain in reading speed of 3 students in a speed-reading program, and the number of weeks they have been in the program Fit a straight line by the method of least squares No. of weeks: 3, 5, 2, 8, 6, 9, 3, 4 Speed gain: 86, 118, 49, 193, 164, 232, 73, 109	Co5	1.2.1	U, A

<table>
<tr>
<td>10</td>
<td>Apply the method of Least square to fit straight line y =a+ bx to the following set of observations.
<table>
<tr><td>x</td><td>1.0</td><td>1.2</td><td>1.4</td><td>1.6</td></tr>
<tr><td>y</td><td>40.170</td><td>73.193</td><td>133.372</td><td>243.02</td></tr>
</table>
</td>
<td>Co5</td>
<td>1.2.1</td>
<td>U, A</td>
</tr>
</table>

B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating

Date:	
Assignment No: 14	
Topic:	Curve fitting by the numerical method
Sub Topics:	Second degree parabola and more general curves
Relevant CO:	Understand the fitting of various curves by method of least square
Objectives:	1. To fit a Second degree parabola by method of least square. 2. To fit general curves by method of least square.

Sr. No.	Question	CO	PI	B.T. level
1	**Find** the best-fit values of a, b and c so that $y = a + bx + cx^2$ fits the data given in the table. x: 1, 2, 3, 4, 5 y: 35, 68, 100, 138, 170	Co5	1.2.1	U, A
2	**Apply** the method of Least square to fit the second degree parabola using the least square method to the following data. Also, **estimate** y at x=6. x: 1, 2, 3, 4, 5 y: 5, 12, 26, 60, 97	Co5	1.2.1	U, A
3	Fit a second degree parabola for the following set of observations x: 1, 2, 3, 4, 5, 6, 7, 8, 9 y: 2, 6, 7, 8, 10, 11, 11, 10, 9 **Find** also difference between the actual value of y and the value of y obtained from the fitted curve in each case when x = 5.	Co5	1.2.1	U, A
4	In a tensile of a metal bar the following observation were made; where x represent the load in tones and y the elongation in thousandth of millimetres: x: 0, 1, 2, 3, 4 y: 1, 1.8, 3.3, 4.5, 6.3 **Determine** a parabolic relation expressing y in terms of x by the method of least squares.	Co5	1.2.1	U, A
5	The following are the data on the drying time of a certain varnish and the amount of an additive that is intended to reduce the drying time? Amount of varnish additive (gm): 0, 1, 2, 3, 4, 5, 6, 7, 8 Drying time(hr): 12, 10.5, 10, 8, 7, 8, 7.5, 8.5, 9 (i) **Apply** the method of Least square to fit a second degree polynomial by the method of least square. (ii) **Use** the result of (i) to predict the drying time of the varnish when 6.5 gms of the additive is being used.	Co5	1.2.1	U, A
6	**Determine** the constants a and b by the least-square method such that $y = ae^{bx}$. Fits the following data: x: 0, 1, 2, 3, 4 y: 1, 1.8, 1.3, 2.5, 6.3	Co5	1.2.1	U, A
7	**Apply** the method of Least square to fit a function of the form $y = ax^b$ x: 1, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0 y: 1.1, 1.3, 1.6, 2.6, 2.7, 3.4, 4.1	Co5	1.2.1	U, A
8	**Apply** the method of Least square to fit a function of the form $y = ab^x$ to the following data:	Co5	1.2.1	U, A

<table>
<tr><td></td><td><table><tr><td>x :</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>y :</td><td>1</td><td>1.0</td><td>1.3</td><td>2.5</td><td>6.3</td></tr></table></td><td></td><td></td><td></td></tr>
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B.T. Level: R: Remembering, U: Understanding, A: Applying, N: Analyzing, E: Evaluating, C: Creating