UNIT I

i) Find harmonic mean, geometric mean and Quadratic mean for the data

x	41	42	44	49	50
f	2	5	8	7	3

ii) The following is the distribution of annual rainfall (inches) recorded at a certain place in India. Find all quartiles. Also find 7^{th} Deciles and 43^{rd} percentile

Rainfall (inches)	20-25	25-30	30-35	35-40	40-45	45-50	50-55
No. Years	2	5	8	12	10	7	6

iii) Calculate variance for the data :

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Numbers of students	10	9	25	30	16	10

iv) Calculate mean, Median and mode for the data :

Marks	70-80	60-70	50-60	40-50	30-40	20-30	10-20
No. of students	10	10	20	28	12	7	13

v) Calculate mean deviation from mode and Quartile Deviation of marks of the students :

Marks	7	8	7	4	5	8	9	8

vi) Find the a) geometric mean b) arithmetic mean c) harmonic mean and d) Quadratic mean for the data of the numbers 3, 5, 6, 6, 7, and 12.

vii) Determine a) 20^{th} , b) 35^{th}, c) 60th and d) 93th percentiles for the data :

Class	10-15	15-20	20-25	25-30	35-40	40-45	45-50
Frequency	3	7	16	12	9	5	2

viii) Apply Sheppard's coprrection to determine standard deviation for the data :

Height(in)	10-15	15-20	20-25	25-30	35-40	40-45	45-50
Numbers of students	3	7	16	12	9	5	2

ix) Calculate Quartile deviation and mean deviation from the mean for the data :

Weight(lb)	118-126	127-135	136-144	145-153	154-162	163-171	172-180
frequency	3	5	9	12	5	4	2

x) Calculate mean median and mode of the following data:

Class	10-15	15-20	20-25	25-30	35-40	40-45	45-50
Frequency	2	5	9	12	16	7	3

xi) Write empirical relations of measures of central tendency and dispersion.

xii) State merits and demerits of mean, median and mode

UNIT II

i) Find the first four moments about the mean for the set of numbers : 2, 5. 8,11, 14, 17

ii) Find the (a) first, (b) second, (c) third and (d) fourth moments about the mean of the set of the numbers: 2, 3, 7, 8, 10.

iii) Find the first four raw moments for the set of numbers : 2, 5. 8,11, 14, 17

iv) Determine the a) Karl Pearson’s coefficient of Skewness b) Bowley's coefficient of Skewness for the data : 4, 7, 5, 9, 8, 3, 6

v) Calculate a) Karl Pearson’s coefficient of Skewness b) Bowley's coefficient of Skewness for the data.

X	12	14	16	18	20	22
F	1	4	6	10	7	2

vi) Find coefficient of kurtosis of the set of the numbers: 2, 3, 7, 8, 10.

vii) Calculate coefficient of kurtosis for the data.

X	12	14	16	18	20	22
F	1	4	6	10	7	2

viii) What is kurtosis? Explain different types of kurtosis.

ix) What is skewness? Explain different types of skewness.

x) A ball is drawn at random from a box containing 6 red balls, 4 white balls, and 5 blue balls. Determine the probability that the ball drawn is a) red b) white c) blue d) not red e) red or white.

xi) Two cards are drawn from a well-shuffled ordinary deck of 52 cards. Find the probability that they are both aces if the first card is (a) replaced and (b) not replaced.

xii) Three cards are drawn from a deck of 52 cards. Find the probability that (a) two are jacks and one is a king, (b) all cards are of one suit, (c) all cards are of different suits, and (d) at least two aces are drawn.

xiii) The masses of 72 ball bearings are normally distributed, with a mean of 22.40 g and a standard deviation of 0.048 g. If 300 random samples of size 36 are drawn from this population, determine the expected mean and standard deviation of the sampling distribution of means if the sampling is done (a) with replacement and (b) without replacement.

xiv) The masses of 1500 ball bearings are normally distributed, with a mean of 22.40 g and a standard deviation of 0.048 g. If 300 random samples of size 36 are drawn from this population, determine the expected mean and standard deviation of the sampling distribution of means if the sampling is done (a) with replacement and (b) without replacement.

UNIT III

i) A company has 500 cables. A test of 40 cables selected at random showed a mean breaking strength of 2400 pounds (lb) and a standard deviation of 150 lb. What are the 95% and 99% confidence limits for estimating the mean breaking strength of the remaining 500 cables?

ii) A random sample of 50 mathematics grades out of a total of 200 showed a mean of 75 and a standard deviation of 10. What are the 95% and 99% confidence limits for estimates of the mean of the 200 grades?

iii) In a sample of five measurements, the diameter of a sphere was recorded by a scientist as 6.33, 6.37, 6.36, 6.32, and 6.37 centimeters (cm). Determine unbiased and efficient estimates of (a) the true mean and (b) the true variance.

iv) A sample poll of 100 voters chosen at random from all voters in a given district indicated that 55% of them were in favor of a particular candidate. Find the (a) 95%, (b) 99%. confidence limits for the proportion of all the voters in favor of this candidate.

v) The breaking strengths of cables produced by a manufacturer have a mean of 1800 pounds (lb) and a standard deviation of 100 lb. By a new technique in the manufacturing process, it is claimed that the breaking strength can be increased. To test this claim, a sample of 50 cables is tested and it is found that the mean breaking strength is 1850 lb. Can we support the claim at the 0.01 significance level?

vi) The claim is made that 40% of tax filers use computer software to file their taxes. In a sample of 50, 14 used computer software to file their taxes. Test H0 : p=0.4 versus Ha : p<0.4 at α = 0.05 where p is the population proportion who use computer software to file their taxes.

vii) A study compared the grade point averages (GPAS) of 50 high school seniors with a TV in their bedroom with the GPAS of 50 high school seniors without a TV in their bedrooms. The results are shown in Table below. The alternative is that the mean GPA is greater for the group with no TV in their bedroom. Give the value of the test statistic assuming no difference in mean GPAs.($\alpha = 0.01$)

	T.V in Bed Room	No T.V in Bed Room
N	50	50
Mean	2.58	2.77
Standard Deviation	0.55	0.65

viii) Two groups, A and B, consist of 100 people each who have a disease. A serum is given to group A but not to group B (which is called the control); otherwise, the two groups are treated identically. It is found that in groups A and B, 75 and 65 people, respectively, recover from the disease. At significance levels of (a) 0.01, (b) 0.05, and (c) 0.10, test the hypothesis that the serum helps cure the disease.

ix) It has been found from experience that the mean breaking strength of a particular brand of thread is 9.72 ounces (oz) with a standard deviation of 1.40 oz. A recent sample of 36 pieces of this thread showed a mean breaking strength of 8.93 oz. Test the null hypothesis H0 : $\mu = 9.72$ versus the alternative H0 : $\mu < 9.72$ by giving the value of the test statistic and the critical value for $\alpha = 0.10$ and $\alpha = 0.025$.

x) On an elementary school spelling examination, the mean grade of 32 boys was 72 with a standard deviation of 8, while the mean grade of 36 girls was 75 with a standard deviation of 6. The alternative is that the girls are better at spelling than the boys. Give the value of the test statistic assuming no difference in boys and girls at spelling. Give your conclusion for $\alpha = 0.05$ and for $\alpha = 0.10$.

UNIT IV

Q.1 A sample of 10 measurements of the diameter of a sphere gave a mean .. = 438 centimeters (cm) and a standard deviation s = 0.06 cm. Find the (a) 95% and (b) 99% confidence limits for the actual diameter.

Q.2 A sample of 12 measurements of the breaking strength of cotton threads gave a mean of 7.38 grams (g) and a standard deviation of 1.24 g. Find the (a) 95%, (b) 99% confidence limits for the actual breaking strength.

Q.3 Five measurements of the reaction time of an individual to certain stimuli were recorded as 0.28, 0.30, 0.27, 0.33, and 0.31 seconds. Find the (a) 95% and (b) 99% confidence limits for the actual reaction time.

Q.4 The standard deviation of the lifetimes of a sample of 200 electric light bulbs is 100 hours (h). Find the (a) 95% and (b) 99% confidence limits for the standard deviation of all such electric light bulbs.

Q.5 The standard deviation of the lifetimes of a sample of 200 electric light bulbs is 100 hours (h). Find the (a) 95% and (b) 99% confidence limits for the standard deviation of all such electric light bulbs.

Q.6 The intelligence quotients (IQs) of 16 students from one area of a city showed a mean of 107 and a standard deviation of 10, while the IQs of 14 students from another area of the city showed a mean of 112 and a standard deviation of 8. Is there a significant difference between the IQs of the two groups at significance levels of (a) 0.01 and (b) 0.05?

Q.8 The mean lifetime of electric light bulbs produced by a company has in the past been 1120 h with a standard deviation of 125 h. A sample of eight electric light bulbs recently chosen from a supply of newly produced bulbs showed a mean lifetime of 1070 h. Test the hypothesis that the mean lifetime of the bulbs has not changed, using significance levels of 0.01

Q.9 Two types of chemical solutions, A and B, were tested for their pH (degree of acidity of the solution). Analysis of six samples of A showed a mean pH of 7.52 with a standard deviation of 0.024. Analysis of five samples of B showed a mean pH of 7.49 with a standard deviation of 0.032. Using the 0.05 significance level, determine whether the two types of solutions have different pH values.

Q.10 ii) In the past, the standard deviation of weights of certain 40.0-ounce packages filled by a machine was 0.25 ounces (oz). A random sample of 20 packages showed a standard deviation of 0.32 oz. Is the apparent increase in variability significant at the (a) 0.05 and (b) 0.01 levels?

Q.11 The standard deviation of the breaking strengths of certain cables produced by a company is given as 240 pounds (lb). After a change was introduced in the process of manufacture of these cables, the breaking strengths of a sample of eight cables showed a standard deviation of 300 lb. Investigate the significance of the apparent increase in variability, using significance levels of 0.01

Q.12 Two samples of sizes 9 and 12 are drawn from two normally distributed populations having variances 16 and 25, respectively. If the sample variances are 20 and 8, determine whether the first sample has a significantly larger variance than the second sample at significance levels of (a) 0.05, (b) 0.01

Q.13 Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis that the true variances are equal. against the alternative that they are not. at the 10% level. [Assume that P (F10,8 . 3.35) = 0.05 and P (F8,10 . 3.07) = 0.05

Q.14 Two samples of sizes 8 and 10 are drawn from two normally distributed populations having variances 20 and 36, respectively. Find the probability that the variance of the first sample is more than twice the variance of the second sample.

Q.15 Two samples of sizes 10 and 15 are drawn from two normally distributed populations having variances 40 and 60, respectively. If the sample variances are 90 and 50, determine whether the sample 1 variance is significantly greater than the sample 2 variance at significance levels of (a) 0.05 and (b) 0.01.

Q.16 Table shows the observed and expected frequencies in tossing a die 120 times.

Die face	1	2	3	4	5	6
Observed Frequency	25	17	15	23	24	16
Expected Frequency	20	20	20	20	20	20

Test the hypothesis that the die is fair using a 0.05 significance level by calculating 2 and giving the 0.05 critical value and comparing the computed test statistic with the critical value.

Q17 Three coins were tossed a total of 240 times, and each time the number of heads turning up was observed. The results are shown in Table, together with the results expected under the hypothesis that the coins are fair. Test this hypothesis at a significance level of 0.05.

No. of Heads	0	1	2	3
Observed Frequency	24	108	95	23
Expected Frequency	30	90	90	30

Q.18 Table shows the observed and expected frequencies in tossing a die 120 times.

Die face	1	2	3	4	5	6
Observed Frequency	25	17	15	23	24	16
Expected Frequency	20	20	20	20	20	20

Q.19 Test the hypothesis that the die is fair using a 0.05 significance level by calculating χ^2 and giving the 0.05 critical value and comparing the computed test statistic with the criti In 360 tosses of a pair of dice, 74 sevens and 24 elevens are observed. Using the 0.05 significance level, test the hypothesis that the dice are fair.

Q.20 In 200 tosses of a coin, 115 heads and 85 tails were observed. Test the hypothesis that the coin is fair using significance levels of (a) 0.05 and (b) 0.01.

Q.21 In his experiments with peas, Gregor Mendel observed that 315 were round and yellow, 108 were round and green, 101 were wrinkled and yellow, and 32 were wrinkled and green. According to his theory of heredity, the numbers should be in the proportion 9 : 3 : 3 : 1. Is there any evidence to doubt his theory at the (a) 0.01 and (b) 0.05 significance levels?

Q.22 Table below shows the result of an experiment to investigate the effect of vaccination of laboratory animals against a particular disease. Using the 0.01 significance levels, test the hypothesis that there is no difference between the vaccinated and unvaccinated groups (i.e., that vaccination and this disease are independent).

	Got disease	Did not get disease
Vaccinated	9	42
Not Vaccinated	17	28

Q.23 Table shows the relationship between hair and eye colour of a sample of 200 students. Find the coefficient of contingency. Using the 0.01 significance levels, test the hypothesis that there is no difference between the eye colours of two groups

Eye Color	Hair Color	
	Blonde	Not Blonde
Blue	49	25
Not blue	30	96

Q.24 Table shows the relation between the performances of students in mathematics and physics. Test the hypothesis that performance in physics is independent of performance in mathematics, using the (a) 0.05 and (b) 0.01 significance levels.

		Mathematics		
Physics		High Grades	Medium Grades	Low Grades
	High Grades	56	71	12
	Medium Grades	47	163	38
	Low Grades	14	42	85

Q.25 On a particular proposal of national importance, Democrats and Republicans cast their votes as shown in given table. At significance levels of (a) 0.01 and (b) 0.05, test the hypothesis that there is no difference between the two parties in so far as this proposal is concerned.

	In Favour	Opposed	Undecided
Democrats	85	78	37
Republicans	118	61	25

UNIT V

i) Fit a straight line by method of least square.

x	10	11	13	13	15	17	20
y	6	7.5	8	8.5	9	9.5	10

ii) Fit a least-squares straight line to the following data:

x	10	12	13	16	17	20	25
y	10	22	24	27	29	33	37

iii) Fit a second degree parabola equation for the following:

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

iv) Fit a second degree parabolic curve for the following:

x	1	2	3	4	5	6	8
y	20	24	36	40	50	60	72

v) Find the coefficient of linear correlation between the variables X and Y presented in table:

x	9	5	11	15	10	13	16
y	11	8	14	20	13	15	22

vi) Find the coefficient of linear correlation from the data giving the number of teachers and the parents spend in waiting for the meeting :

No. of teachers (x)	2	4	6	4	5	3
Waiting Time(y)	18	14	4	6	6	12

vii) Find the coefficient of linear correlation between the variables X and Y presented in table:

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

viii) Fit a trend line by method of least square and hence estimate the trend value for the year 2008

Year	2001	2002	2003	2004	2005	2006	2007
Sales	40	48	65	72	70	62	81

ix) Fit a trend line by method of least square and hence estimate the trend value for the year 2011

Year	2004	2005	2006	2007	2008	2009	2010
No. of Exchanges	8.9	9.7	12.1	14.0	16.6	18.1	18.5

x) Find the regression equation Output on fertilizers.

Fertilizers	0	2	4	6	8	10
Output	110	113	118	119	120	118

xi) Obtain the regression equation $y\ on\ x$ and x on y for the data. Hence estimate a) y when $x = 18$ b) x when $y = 25$

x	9	5	11	15	10	13	16
y	11	8	14	20	13	15	22

xii) Obtain the regression equation $y\ on\ x$ and x on y for the data. Hence estimate a) y when $x = 16$ b) x when $y = 10$

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

xiii) The two regression equations are $5x + 7y = 22\ and\ 6x + 2y = 20$. Find a) mean values of x and y b) coefficient of correlation

xiv) The two regression equations are $4y - 15y + 530 = 0\ and\ 20x - 3y - 995 = 0$. Find a) mean values of x and y b) coefficient of correlation

xv) The two regression equations are $2x + y = 8$ and $x + 5y = 13$. Find a) mean values of x and y b) coefficient of correlation

xvi) The two regression equations are $5x + 3y = 290\ and\ 3x + 2y = 180$. Find a) mean values of x and y b) coefficient of correlation

-------END-----