Time: 2½ Hrs.

Marks:75

Note: (1) All questions are compulsory with internal choice.
(2) Figures to the right indicate full marks.
(3) Symbols have their usual meanings.
(4) Scientific calculator fx 82 series or lower version is only permitted.
(5) Statistical table will be provided on request.

Q.1 **Attempt Any Three of the following.** (15)
(a) Define geometric mean and harmonic mean. State the relation between them.
(b) Calculate the arithmetic mean for the following distribution.

Income (Rs.)	500-1000	1000-1500	1500-2000	2000-2500	2500-3000
No. of person	30	50	100	40	30

(c) Calculate the standard deviation of the heights of 10 students given as

Height (in cms)	161	162	160	163	160	163	164	170	164	164

(d) Calculate Q_1 and Q_3 from the following data

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
No. of students	6	7	5	12	28

(e) Calculate P_{35} and P_{80} from the following data.

Marks	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of students	1	3	11	21	43	32

(f) Define factors and data frames in 'R'. How to create them in 'R'?

Q.2 **Attempt Any Three of the following.** (15)
(a) Find the first four raw moments and then using relation, find the central moments for the following distribution.

Class interval	0-4	4-8	8-12	12-16
Frequency	10	12	15	13

(b) For the following probability density function, $f(x) = \begin{cases} 2e^{-2x} & , x \geq 0 \\ 0 & , x < 0 \end{cases}$. Find

(i) $P(1 \leq X \leq 3)$ (ii) $P(X \geq 0.5)$

(c) A survey of 500 television viewers produced the following information: 285 watch football, 195 watch hockey, 115 watch basketball, 45 watch football and basketball, 70 watch football and hockey, 50 watch hockey and basketball, 50 do not watch any of the three games. Create a Venn diagram and then determine the probability that a viewer selected at random will watch

(i) all three games.
(ii) exactly one of the three games.

(d) A population consists of the five numbers 3, 4, 7, 9 and 12. Consider all possible samples of size 2 that can be drawn with replacement from this population. Find
(i) the population mean
(ii) the population standard deviation
(iii) the mean of the sampling distribution of means
(iv) the standard deviation of the sampling distribution of means

(e) Obtain Karl Pearson's measure of skewness for the following data.

Values	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	6	8	17	21	15	11	2

(f) Explain the relation between raw moments and central moments.

Q.3 **Attempt Any Three of the following.** (15)
(a) A sample of five measurements of the diameter of a sphere was recorded by a scientist as 6.33, 6.37, 6.36, 6.32 and 6.37cm. Assume that the measured diameter is normally distributed. Determine unbiased and efficient estimates of
(i) true mean (ii) true variance

(b) A candidate at an election, claim that, in a locality, 90% voters support him. Verify his claim at 5% level of significance; if in a random sample of 400 voters from a locality, 320 supported him.

(c) Twenty sample of size 100 each are selected from a very large consignment of blades. Find the expected number of samples that will have at least 14 defective blades, if the consignment has 10% defective blades.

(d) What is hypothesis test? Explain types of hypotheses. Explain level of significance.

(e) A random sample of 50 items gives the mean 6.2 and standard deviation 10.24. Can it be regarded as drawn from a normal population with mean 5.4 at 5% level of significance?

(f) Measurements of the diameter of a random sample of 200 ball bearings made by a certain machine during one week showed a mean of 0.824 inch and a standard deviation of 0.042 inch. Find

    (i) 95% confidence limit   (ii) 99.73% confidence limit

for the mean diameter of all the ball bearings.

Q.4   Attempt **Any Three** of the following.   (15)

(a) Nine items of a sample had the following values 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of 9 items differ significantly from the assumed population mean 47.5?

$$(t_{tab} = 2.306 @ 5\% \ LOS \ for \ dof \ 8)$$

(b) A certain coin is showed up head 270 occasions in 500 tosses. Test the claim that the coin is unbiased.

(c) In an experiment to study the independence of hypertension on smoking habits, the following data are taken from 180 individuals.

	Non smokers	Moderate smokers	Heavy smokers	Total
Hypertension	21	36	30	87
No-hypertension	48	26	19	93
Total	69	62	49	180

Test the hypothesis at 0.05 level of significance, that the presence or absence of hypertension is independent of smoking habits

(d) A sample of size 16 from a normal population showed a mean of 41.6 and the sum of the squares of deviations from this mean is 135. Obtain 95% and 99% fiducial limits for the mean.

(e) Write a short note on contingency table.

(f) The means of two random samples of size 9 and 7 are 196.42 and 198.82 respectively. The sum of the squares of the deviation from the means is 26.94 and 18.73 respectively. Can the samples be considered to have been drawn from the same population?

$$(t_{tab} = 2.145 @ 5\% \ LOS \ for \ dof \ 14) \ .$$

Q.5   Attempt **Any Three** of the following.   (15)

(a) Find the co-efficient of correlation between height of father and height of son from the following data.

Height of father	65	66	67	67	68	69	71	73
Height of son	67	68	64	68	72	70	69	70

(b) Calculate the rank correlation coefficient from the following data.

X	45	70	65	30	90	40	50	57	85	60
Y	35	90	70	40	95	40	60	80	80	50

(c) Obtain the equation of line of regression of y on x from the following data and estimate y for $x = 73$.

X	70	72	74	76	78	80
Y	163	170	179	188	196	220

(d) From the following data of 8 pairs of observations, calculate the coefficient of correlation between x and y.

	x	y
Mean	68.25	68.5
SD	2.487	2.236

Summation of the product of the deviations of x and y from their respective means is 26.

(e) Find the law of the form $y = ab^x$ to the following data

X	2	3	4	5	6
Y	144	172.8	207.4	248.8	298.5

(f) Write a short note on correlation.

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