Duration:2hours

Max.Marks: 80

Instructions: 1) All question are compulsory (choice is internal)
2) Start each new question on a fresh page
3) Figures to the right indicate full marks
4) Programmable Calculators not allowed
5) Log tables and graph papers will be supplied on request.

Q.1 Attempt the following:

a) Illustrate and distinguish between positive and negative correlation   (3)

b) Of the 12 Accounts held in a file, four contain procedural error in posting account balances. If an auditor samples two accounts at random, what is the probability that:
   i)   No. error occurs
   ii)   Atleast one will contain an error?   (6)

c) From a well shuffled pack of cards one card is drawn at random. Find the probability that it is i) an ace card, ii) Spade card and iii) King of hearts or diamond card.   (7)

OR

Q.I Attempt the following:

x) Explain scatter diagram.   (3)

y) Suppose that in key punching of 80 columns IBM cards the mean of no. of mistakes per card is 0.3. What % of cards will have :
   i)   No mistakes
   ii)   Two mistakes.   (6)

z) Given $P(A) = 0.3, P(B) = 0.5, P(A \cap B) = 0.2$, find $(A \cup B)$ and $P(\overline{A \cup B})$.   (7)

Q.2 Attempt the following:

a) Define 1) Independent events and 2) Conditional events.   (3)

b) For the following data calculate Spearman's Rank correlation coefficient.   (6)

x	10	12	15	17	19	7
y	12	15	16	18	24	42

c) Draw a suitable control chart for the following data pertaining to the no. of foreign coloured threads (considered as defects) in 15 pieces of cloth of 2 X 2 mof a certain make of synthetic fibre and state the conclusion.   (7)

7,12,3,20,21,5,4,3,10,8,0,9,6,7,20

OR

Q.II Attempt the following:

x) Define 1) Random experiment 2) Mutually exclusive events.   (3)

y) The coefficient of rank correlation of marks obtained by 9 students was calculated to be 0.4. It was later discovered that the value of the difference between the ranks for one student was written wrongly as 6 instead of 8. Find the correct value of coefficient of rank correlation. **(6)**

z) Five samples, each of size 4 are drawn from a population and the readings obtained from them are as follows: **(7)**

Sample No.:	S_1	S_2	S_3	S_4	S_5
Fraction defectives:	0.46	0.54	0.51	0.46	0.53

Find the control limits and draw P-chart. State whether system is in control or not

Q.3 Attempt the following:

a) Write a short note on stratified sampling. **(3)**

b) Find the two regression equation for the following data: **(6)**

$$\sum X = 20, \sum Y = 11.58, \sum X^2 = 90, \sum Y^2 = 27.03, \sum XY = 47.13, n = 5$$

c) If a random sample of size 20 from a normal population with $S.D. = 5.2$ show a mean of 16.9, test at 5% level of significance that the population mean is 15.5. Also calculate 99% confidence limit for mean. **(7)**

OR

Q.III Attempt the following:

x) Write a short note on purposive sampling. **(3)**

y) The two regression equations are $10x + 3y - 62 = 0$ and $6x + 5y - 50 = 0$. Identify the regression of x and y. Hence find $\bar{x}, \bar{y}$ and γ and if $\sigma_x = 2$ find σ_x. **(6)**

z) i) A sample of 600 persons selected at random from a large city, gives the result that males are 53%. Is there a reason to doubt the hypothesis that males and females are in equal no. in city. **(4)**

ii) In a sample survey of 1000 housewives in a city 23% prefer a particular brand of a pressure cooker. Find 99% confidence limit for the percentage of all housewives in the city preferring that brand of cooker. **(3)**

Q.4 Attempt the following:

a) State the condition under which Binomial distribution is used. **(3)**

b) Determine the mostly likely salary of husband when wife's salary is Rs.1500. **(6)**

Wife's salary:	700	800	1200	1400	1700	1900
Husbands Salary:	800	1000	2000	2100	1300	2400

c) Six samples of Size 4 each were drawn and the range of each sample is noted down. Find the CL, UCL and LCL. Also draw the control chart for range and comment.
(Given $D_3 = 0, D_4 = 2.282$ for the sample of size 4) **(7)**

Sample :	S_1	S_2	S_3	S_4	S_5	S_6
Range(R):	0.2	0.1	0.56	0.22	0.14	0.21

OR

Q.IV Attempt the following:

x) For a Poisson distribution $P(x = 0) = e^{-0.4}$. Find mean and standard deviation and $P(x = 1)$. **(3)**

y) From the following table showing age of cars of a certain make and annual maintenance costs, obtain the regression equation for costs related to age. **(6)**

Age of Cars:	2	4	6	7	8	10	12
Annual cost:	1000	1400	1800	1900	1700	2100	2000

Estimate the approximate cost of maintaining 3 years old car of the same make.

z) Six samples of size 4 each are drawn and then mean and range for each sample is noted down. Find the CL, UCL, LCL for the system and draw the control chart $\bar{X}$, Also check whether the system is in control($A_2 = 0.729\ for\ size\ 4$). **(7)**

Sample	S_1	S_2	S_3	S_4	S_5	S_6
Mean	1.35	2.51	1.8	2.39	1.48	2.11
Range	0.3	0.5	0.4	0.6	0.3	0.7

Q.5 Attempt the following:

a) Explain the terms 1) Point estimate and 2) Interval estimate. **(3)**

b) A normal distribution has mean of 20 and $S.D. = 4$. Find the probability of
   i) $P(20 < x < 23)$
   ii) $P(17 < x < 19)$

(*Area under the standard normal curve from* $t = 0$ *to* $t = 0.75$ *is* 0.2734 *and* $t = 0$ *to* $t = 0.25$ *is* 0.0987) **(6)**

c) i) Two cards are drawn from a pack of cards without replacements. Find the probability that the cards are 1) both kings 2) An ace and a queen **(4)**

   ii)   For a bivariate data $b_{xy} = \frac{9}{4}$, $b_{yx} = \frac{4}{25}$, $\sigma_x = 15$ Find the values of γ and σ_y. **(3)**

OR

Q.V Attempt the following:

x) Explain 1) Level of significance and 2) Test of significance. **(3)**

y) The mean yield of one plot is 662 kilos with a S.D of 32 kilos. Assuming normal distribution, how many one acre plots in a batch of 1000 plots would you expect to have yield:
   i)   Over 700 kilos
   ii)   Below 650 kilos

   (*Area under the stamdard normal curve for* $t = 0$ *to* $t\ 1.19$ *is* 0.3830, *and* $t = 0$ *to* $t = 0.38$ *is* 0.1480). **(6)**

z) i) A player tosses a coin twice. He wins Rs.8 if 2 heads occur, Rs.3 if one head occurs and loses Rs.5 if no head occurs. Find his expected gain. **(4)**

   ii) Karl Pearsons co-efficient of correlation between two variables x and y is 0.521, their covariance is 7.8. If variance of x is 16.Find the standard deviation of y . **(3)**