

**STATISTICAL TECHNIQUES-II**

Duration: 2 hours

Max. Marks: 80

**Instructions:**

1. All questions are compulsory.
2. Start each new question on a fresh page.
3. Figures to the right indicate full marks
4. Graph paper will be provided on request.
5. Use of calculator is allowed.

- Q.1 a What is regression? Why are there in general two regression lines? Under what conditions can there be only one line. 3
- b Find the coefficient of correlation between advertising expenditure (in 1000 Rs.) and actual sales (in 1000 Rs.) given below: 6

Advt Expenses	3	7	4	2	1	4	1	2
Sales	11	16	9	4	7	6	3	8

- c Given the two regression equations as  $4x - y - 23 = 0$  and  $3x - 2y + 4 = 0$ . Find (i) the regression coefficient, (ii) the mean values of  $x$  and  $y$ . 7

**OR**

- x Define scatter diagram and depict the scatter diagram for perfect positive correlation, perfect negative correlation and no correlation. 3
- y Find rank correlation coefficient between mathematics and statistics score 6

Maths	38	39	40	42	45	39	40
Stats	46	52	53	49	55	54	57

- z Find the regression equation of  $y$  on  $x$  7

$x$	3	5	7	9	11
$y$	9	12	16	14	15

- Q.2 a What is the difference between correlation and regression. 3
- b It is observed that 2% of bulbs made by a factory are defective. Find probability that in a sample of 200 bulbs, (a) less than 2 bulbs (b) more than 3 bulbs are defective (given  $e^{-1} = 0.3679$ ,  $e^{-4} = 0.0183$ ). 6
- c The mean breaking strength of cables supplied by a manufacturer is 1800 with standard deviation 100. A random sample shows mean breaking strength as 1850. Can it be regarded that the sample has been drawn from the population (the sample size being 50). Also set up 95% confidence limits of the mean breaking strength of cables. 7

**OR**

- Q.II x Find the coefficient of correlation given 3
- $\sum x^2 = 1128$ ,  $\sum y^2 = 1380$ ,  $\sum x = 96$ ,  $\sum y = 84$ ,  $\sum xy = 312$ ,  $n = 12$ .

- y The distribution of heights of cakes with a certain mix is normal with mean 6 cms and standard deviation of 0.6cms. There are 250 cakes with height above 6.4cms. How many cakes were baked in all.  
[Given  $P(0 < z < 2/3) = 0.25$  where  $z$  is standard normal variate] 6
- z 1. From a certain process, it was concluded that on the average, there are 15 percent defectives. The new material purchased was used in the process and it was noticed that out of total output of 400 units 48 were found to be defective. Would you accept the new material. (at 5% level of significance). 4
2. Find the 95% confidence limit for a population mean, if the mean is 60, standard deviation is 2 and  $n$  is 64 3

- Q.3 a Explain the terms: 3
1. Hypothesis
  2. Null Hypothesis
  3. Alternative Hypothesis.
- b Coefficient of correlation between  $X$  and  $Y$  for 20 items is 0.3; mean of  $X$  is 15 and that of  $Y$  is 20, standard deviations are 4 and 5 respectively. At the time of calculations one pair ( $x=27, y=30$ ) was wrongly taken as ( $x=17, y=35$ ). Find the correct coefficient of correlation. 6
- c A die is thrown three times. Getting a '3' or a '6' is considered a success. Find the probability of at least two successes 7

**OR**

- QIII x Differentiate between 3
- (i) Type I and Type II errors.
  - (ii) Critical region and Region of Acceptance
- y Following data gives the number of officers on duty and the waiting time for customers. Find the regression line of waiting time on the number of officers on duty. How long will customers have to wait if there are 6 officers on duty on a particular day? 6
- |                      |    |   |   |    |   |
|----------------------|----|---|---|----|---|
| No. of officers      | 3  | 4 | 5 | 3  | 4 |
| Waiting time in mins | 12 | 7 | 5 | 11 | 8 |
- z The marks obtained in a statistics examination are assumed to have a normal distribution with mean 75 and standard deviation is 5. Find the probability of a randomly selected student obtain marks: 7
- (i) Between 65 and 75
  - (ii) Below 70
- [Given  $P(0 < z < 2) = 0.4772$  and  $P(0 < z < 1) = 0.4413$ , where  $z$  is standard normal variate].

- Q.4 a What are the advantages of sampling? 3
- b A machine is set to deliver packets of a given weight. Eight samples of size 6 each were recorded. Below are given relative data. 6

Sample	1	2	3	4	5	6	7	8
Mean	15	17	15	18	17	14	18	15
Range	7	7	4	5	9	7	12	8

Draw a control chart for  $\bar{X}$  and comment on state of control.

(For sample size 6,  $A_2=0.483$ )



- c Out of a lot of 100 screws 70 are good and 30 are defective. Find the probability that out of 2 screws selected at random (i) both are good, (ii) first good and second defective. 7

OR

- QIV x Explain census method and sampling method of data collection and distinguish them. 3

- y 1. What are advantages of statistical quality control? 2  
2. Obtain control limits for the range chart for 10 samples of size 5 for the data given below. Can the process is said to be under control with respect to range? 4

Sample No.	1	2	3	4	5	6	7	8	9	10
Range	2.1	3.1	3.9	2.1	1.9	3.0	2.5	2.8	2.5	2.1

(for  $n=5$ ,  $D_3=0$  and  $D_4=2.115$ )

- z In a Pizza Hut, the following distribution is found for the daily demand of pizzas. Find the expected daily demand and also the variance. 7

No. of Pizzas	5	6	7	8	9	10
Probability	0.07	0.2	0.3	0.3	0.07	0.06

- Q.5 a What is a control chart? Explain. 3  
b The following figures give the number of defectives in 20 samples, each sample containing 2,000 items. Draw the suitable control chart and comment if the process can be regarded in control or not? 6

425	430	216	341	225	322	280	306	337	305
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- c A random variable X has following probability distribution. Find k. Hence find (i)  $P(X < 2)$  (ii)  $P(X \leq 7)$  (iii)  $P(3 < X \leq 6)$ . 7

X	0	1	2	3	4	5	6	7	8
P(X)	k	2k	3k	4k	4k	3k	2k	k	k

OR

- Q.V x What do you mean by statistical quality control? What are the advantage when a process is working in a state of statistical control. 3

- y The following table gives the number of defects in carpets manufactured by a company. Construct the control chart for the number of defects and comment if the process can be regarded in control or not? 6

Serial No. of carpet	1	2	3	4	5	6	7
No. of defects	2	5	5	6	1	5	7

- z In a group of 80 persons, 30 like western music, 40 like Indian music and 10 like both. Find the probability that a person selected at random from this group. 7

1. Likes at least one type of music.
2. Likes only Indian music.
3. Does not like any type of music.
4. Likes only one type of music.