

(6 pages)

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P/ID 17406/RBG

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Time : Three hours

Maximum : 75 marks

PART A — ( $5 \times 5 = 25$  marks)

Answer ALL questions.

1. (a) If two dice are thrown, what is the probability that the sum is
- (i) greater-than 8 and
  - (ii) neither 7 nor 11.

Or

- (b) The diameter of an electric cable, say  $X$  is assumed to be a continuous random variable with p.d.f.  $f(x) = 6x(1-x)$ ,  $0 \leq x \leq 1$ .
- (i) Check that  $f(x)$  is pdf and
  - (ii) Determine a number  $b$  such that  $P(X < b) = P(X > b)$ .
2. (a) A manufacturer, who produces medicine bottles, finds that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles.

Using Poisson distribution, find how many boxes will contain :

- (i) no defective
- (ii) at least two defective

Or

- (b) List out the chief characteristics of the normal distribution and normal probability curve.

3. (a) Find the coefficient of the correlation for the following :

X: 39 65 62 90 82 75 25 98 36 78

Y: 47 53 58 86 62 68 60 91 51 84

Or

- (b) Two random variables have the regression equation :

$$3X + 2Y - 26 = 0$$

$$6X + Y - 31 = 0$$

If the variable of  $X = 25$ , find the standard deviation of  $Y$  from the data given above.

4. (a) Before an increase in excise duty on tea 400 people out of a sample of 500 persons were found to be tea drinkers. After increase in the duty, 400 persons were known to be tea

drinkers in a sample of 600 people. Do you think there has been a significant decrease in the consumption of tea after the increase in the excise duty at 1% level of significance.

Or

- (b) From the data given below about the treatment of 250 patients suffering from a disease, state whether the new treatment is superior to the conventional treatment.

Treatment	No. of patients		Total
	Favourable	Not favourite	
New	140	30	170
Conventional	60	20	80
Total	200	50	250

5. (a) Explain briefly Latin squares experimental design.

Or

- (b) Write short notes on any two methods for determining trend.

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

6. Assume that a factory has two machines. Past records show that machine 1 produces 30% of the items of output and machine 2 produces 70% of the items. Further, 5% of the items produced by machine 1 were defective and only 1% produced by machine 2 were defective. If a defective item is drawn at random, what is the probability that the defective item was produced by machine 1 or machine 2?
7. If  $X$  is the number scored in a throw of a fair die, show that the Chebychev's inequality gives  $P[|X - \mu| > 2.5] < 0.47$ , where  $\mu$  is the mean of  $X$ , while the actual probability is zero.
8.  $X$  is a normal variate with mean 30 and S.D. 5. Find the probabilities that
- (a)  $26 \leq X \leq 40$
  - (b)  $X \geq 45$  and
  - (c)  $|X - 30| > 5$ .

9. (a) A sample of 100 items is taken at random, from a batch known to contain 40% defective. What is the probability that the sample contains
- (i) atleast 44 defectives
  - (ii) exactly 44 defectives.
- (b) Differentiate between correlation and regression.
10. Obtain the rank correlation coefficient for the following data :
- X: 68 64 75 50 64 80 75 40 55 64  
Y: 62 58 68 45 81 60 68 48 50 70
11. Discuss various types of sampling with an example for each.
12. Below are given the gain in weights (in kgs) of pigs fed into two diets *A* and *B*.

Gain in weight

Diet *A* : 25, 32, 30, 34, 24, 14, 32, 24, 30, 31, 35, 25.

Diet *B* : 44, 34, 22, 10, 47, 31, 40, 30, 32, 35, 18, 21, 35, 29, 22.

Test, if the two diets differ significantly as regards their effect on increase in weight.

13. The following figures related to the number of units sold in five different areas by four salesman.

Area	Number of units			
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
1	80	100	95	70
2	82	110	90	75
3	88	105	100	82
4	85	115	105	88
5	75	90	80	65

Is there a significant difference in the efficiency of these salesman?

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