

(6 pages)

MAY 2015

P/ID 17508/PCASH

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Time : Three hours

Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is  $\frac{1}{7}$  and that of wife's selection is  $\frac{1}{5}$ . What is the probability that
  - (a) both of them will be selected ?
  - (b) none of them will be selected?
2. Find the expected value  $E(x)$  and variance of the following data:

|          |               |                |               |                |                |
|----------|---------------|----------------|---------------|----------------|----------------|
| $x :$    | -10           | -20            | 30            | 75             | 80             |
| $P(x) :$ | $\frac{1}{5}$ | $\frac{3}{20}$ | $\frac{1}{2}$ | $\frac{1}{10}$ | $\frac{1}{20}$ |

3. The probability of a component failure is 0.05 out of 14 components. Using Binomial distribution, find the probability that atleast 3 will fail.
4. The lifetime of a watch is exponentially distributed with mean 120 days. Find the probability that such a watch will have to set in less than 24 days.
5. The ranking of 10 students in two subjects A and B are as follows. Find the correlation coefficient.

A: 3 5 8 4 7 10 2 1 6 9

B: 6 4 9 8 1 2 3 10 5 7

6. Explain systematic random sampling.
7. Explain the basic principles of Experimental design.
8. Explain the method of Simple average and Ratio to trend method.

PART B — (7 × 10 = 70 marks)

Answer any SEVEN questions.

9. In a bolt factory A, B and C manufacture respectively 25%, 35% and 40% of the total of their output 5, 4, 2 percents are defective bolts. A bolt is drawn at random from the product and is found to be defective. Using Baye's theorem, find the probabilities that it was manufactured by machines A, B and C.

2      **P/ID 17508/PCASH**

10. For geometric distribution  $P(x) = 2^{-x}$ ,  $x = 1, 2, 3, \dots$ , prove that Chebychev's inequality given  $P(|x - 2| \leq 2) > \frac{1}{2}$ , while the actual probability is  $\frac{15}{16}$ .
11. If  $x$  is a Poisson variate such that  $P(X = 2) = 9P(X = 4) + 90P(X = 6)$ . Find mean  $E(x^2)$  and  $P(x \geq 2)$ .
12.  $x$  is normally distributed and the mean of  $x$  is 12 and S. D. is 14. Find out the probability of the following:
- (a)  $x \geq 20$ ,
  - (b)  $x \leq 20$  and
  - (c)  $0 \leq x \leq 12$
13. Fit a parabola of second degree to the following data.

|    |   |     |     |     |     |
|----|---|-----|-----|-----|-----|
| X: | 0 | 1   | 2   | 3   | 4   |
| Y: | 1 | 1.8 | 1.3 | 2.5 | 6.3 |

14. On the basis of observations made on 35 cotton plants, the total correlations of yield of cotton, seed vessels and height are found to be  $r_{12} = 0.863$ ,  $r_{13} = 0.648$ ,  $r_{23} = 0.709$ . Determine the multiple correlation  $R_{1.23}$  and the partial correlation  $r_{12.3}$  and  $r_{13.2}$ .
15. Two random samples of sizes 8 and 11, drawn from two normal populations are characterized as follows:

|             | Sample size | Sum of observations | Sum of squares of observations |
|-------------|-------------|---------------------|--------------------------------|
| Sample – I  | 8           | 9.6                 | 61.52                          |
| Sample – II | 11          | 16.5                | 73.26                          |

Decide if the two populations can be taken to have the same variance using F – test.

4 **P/ID 17508/PCASH**

[P.T.O.]

16. A die is thrown 132 times with the following results:

No. turned up:    1    2    3    4    5    6

Frequency:        16   20   25   14   29   28

Test the hypothesis that die is unbiased using  $\chi^2$ .

17. In order to determine whether there is significant difference in the durability of 3 makes of computers, samples of size 5 are selected from each make and frequency of repair during the first year of purchase is observed. The result are as follows:

| Makes | Values of $x_{ij}$ |    |    |    |   |
|-------|--------------------|----|----|----|---|
| A     | 5                  | 6  | 8  | 9  | 7 |
| B     | 8                  | 10 | 11 | 12 | 4 |
| C     | 7                  | 3  | 5  | 4  | 1 |

Perform analysis of variance and state your conclusions.

18. Calculate the seasonal index for the following data by using simple average method.

| Year | I Quarter | II Quarter | III Quarter | IV Quarter |
|------|-----------|------------|-------------|------------|
| 1971 | 35        | 86         | 67          | 124        |
| 1972 | 38        | 109        | 91          | 176        |
| 1973 | 47        | 158        | 104         | 226        |
| 1974 | 61        | 177        | 134         | 240        |
| 1975 | 72        | 206        | 141         | 307        |