

DECEMBER 2014

P/ID 17508/PCASH

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. If  $P(A) = 0.3$ ,  $P(B) = 0.2$ ,  $P(C) = 0.1$  and  $A$ ,  $B$ ,  $C$  are independent events, find the probability of occurrence of atleast one of the three events  $A$ ,  $B$  and  $C$ .
2. From the following data, find  $E(X)$  and  $\text{Var}(X)$ .  

|          |      |      |      |      |      |
|----------|------|------|------|------|------|
| $x$ :    | 1    | 2    | 3    | 4    | 5    |
| $P(x)$ : | 1/15 | 2/15 | 3/15 | 4/15 | 5/15 |
3. If 18 people were affected from a disease and the probability that a patient recovers from that disease is 0.3. If it is assumed to be binomial distribution, what is the probability that 4 to 7 survive?
4. If  $X$  has an exponential distribution with mean 2, find  $P[X < 1 / X < 2]$ .
5. Find Karl Pearson's coefficient of correlation between  $X$  and  $Y$  from the following data :  

|       |     |     |     |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| $X$ : | 78  | 89  | 97  | 69  | 59  | 79  | 61  | 61  |
| $Y$ : | 125 | 137 | 156 | 112 | 107 | 136 | 123 | 108 |

6. Explain Stratified Random Sampling.
7. Explain Randomised block design. What are the advantages and disadvantages of Randomised block design?
8. What are the methods of calculating seasonal variations? Explain in detail.

PART B — (7 × 10 = 70 marks)

Answer any SEVEN questions.

9. An urn contains 5 white and 7 black balls. A second urn contains 7 white and 8 black balls. One ball is drawn at random and put into the second urn without noticing its colour. A ball is then drawn at random from the second urn. What is the probability that it is white?
10. If  $X$  is the number scored in a throw of 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.
11. If the probability of defective fuce from a manufacturing unit is 2% in a box of 200 fuces. Find the probability that (a) exactly 4 fuces are defective (b) more than 3 fuces are defective using Poisson distribution.

12. If  $X$  is normally distributed with mean 30 and standard deviation 5, find

(a)  $P(26 \leq X \leq 40)$

(b)  $P(X \geq 45)$

(c)  $P(|X - 30| > 5)$ .

13. The simple correlation coefficient between temperature, corn yield and rainfall are  $r_{12} = 0.59$ ,  $r_{13} = 0.46$  and  $r_{23} = 0.77$ . Calculate the partial correlation coefficient  $r_{12.3}$ ,  $r_{23.1}$  and  $r_{31.2}$ . Also calculate  $R_{1.23}$ .

14. Fit a straight line to the following data :

|      |     |   |     |   |   |   |
|------|-----|---|-----|---|---|---|
| $X:$ | 1   | 2 | 3   | 4 | 6 | 8 |
| $Y:$ | 2.4 | 3 | 3.6 | 4 | 5 | 6 |

15. Two samples of sizes 9 and 8 give the sum of the squares of deviations from their respective mean equal to 160 and 91 respectively. Can the samples be regarded as drawn from the same normal population? Use  $F$ -test at 5% level of significance.

16. A die is thrown 264 times with the following results :

|                              |    |    |    |    |    |    |
|------------------------------|----|----|----|----|----|----|
| Number appeared on the die : | 1  | 2  | 3  | 4  | 5  | 6  |
| Frequency :                  | 40 | 32 | 28 | 58 | 54 | 60 |

Show that the die is biased at 5% level of significance using  $\chi^2$ .

17. The following are the number of mistakes made in 5 successive days of 4 technicians working in a Photographic Laboratory.

| Technician-I | Technician-II | Technician-III | Technician-IV |
|--------------|---------------|----------------|---------------|
| 6            | 14            | 10             | 9             |
| 14           | 9             | 12             | 12            |
| 10           | 12            | 7              | 8             |
| 8            | 10            | 15             | 10            |
| 11           | 14            | 11             | 11            |

Prepare ANOVA and test at 1% level of significance whether the differences among the 4 sample means can be attributed to chance.

18. Calculate the seasonal index from the following data using the Simple average method :

| Year | 1 <sup>st</sup> Quarter | 2 <sup>nd</sup> Quarter | 3 <sup>rd</sup> Quarter | 4 <sup>th</sup> Quarter |
|------|-------------------------|-------------------------|-------------------------|-------------------------|
| 1974 | 72                      | 68                      | 80                      | 70                      |
| 1975 | 76                      | 70                      | 82                      | 74                      |
| 1976 | 74                      | 66                      | 84                      | 80                      |
| 1977 | 76                      | 74                      | 84                      | 78                      |
| 1978 | 78                      | 74                      | 86                      | 82                      |