(6 pages)

**MAY 2012** **P/ID 17406/RBG**

Time : Three hours Maximum : 75 marks

PART A — ($5 \times 5 = 25$ marks)

Answer ALL questions.

1. (a) A problem in statistics is given to three students A, B and C whose chances of solving it are 1/2, 3/4 and 1/4 respectively. What is the probability that the problem will be solved if all of them try independently?

Or

(b) State

(i) Baye's theorem

(ii) Chebyshev's inequality

(iii) Moment generating function.

2. (a) A random variable $X$ has the following probability function :

| Values of $X$, $x$ : | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| $p(x)$ : | 0 | $k$ | $2k$ | $2k$ | $3k$ | $k^2$ | $2k^2$ | $7k^2 + k$ |

(i) Find $k$

(ii) Evaluate $P(X < 6)$, $P(X \geq 6)$ and $P(0 < X < 5)$.

Or

(b) With the usual notations, find $p$ for a binomial variate $X$, if $n = 6$ and $9P(X = 4) = P(X = 2)$.

3. (a) Two ladies were asked to rank 7 different types of lipsticks. The ranks given by them are as follows :

| Lipsticks : | *A* | *B* | *C* | *D* | *E* | *F* | *G* |
|---|---|---|---|---|---|---|---|
| Neelu : | 2 | 1 | 4 | 3 | 5 | 7 | 6 |
| Neena : | 1 | 3 | 2 | 4 | 5 | 6 | 7 |

Calculate Spearman's rank correlation coefficient.

Or

(b) Write short notes on multiple correlation.

4. (a) The life time of electric bulbs for a random sample of 10 from a large consignment gave the following data :

| Item : | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Life in '000 hours : | 4.2 | 4.6 | 3.9 | 4.1 | 5.2 | 3.8 | 3.9 | 4.3 | 4.4 | 5.6 |

Can we accept the hypothesis that the average life time of bulbs is 4000 hours at 5% level of significance.

Or

(b) A survey of 800 families with 4 children each revealed following distribution

| No. of boys : | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| No. of girls : | 4 | 3 | 2 | 1 | 0 |
| No. of families : | 32 | 178 | 290 | 236 | 64 |

Is the result with the hypothesis that the male and female births are equally probable at 5% level of significance?

5. (a) What is randomized block design? What are its advantages?

Or

(b) Calculate the trend values by the method of least squares :

| Year : | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|
| Sales (Rs. lakhs) : | 125 | 128 | 133 | 135 | 140 | 141 | 143 |

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

6. The contents of wins I, II and III are as follows :

1 white, 2 black and 3 red balls

2 white, 1 black and 1 red balls and

4 white, 5 black and 3 red balls

One win is chosen at random and two balls drawn from it. They happen to be white and red. What is the probability that they come from wins I, II or III?

7. (a) The diameter of an electric cable, say $X$, is assumed to be continuous random variable with pdf $f(x) = 6x(1-x),\ 0 \le x \le 1$

(i) Check that $f(x)$ is a pdf and

(ii) Determine $a$ number $b$ such that $P(X < b) = P(X > b)$. (7)

(b) State the properties of cdf. (3)

8. The following table shows the number of customers returning the products in a marketing territory. The data is for 100 stores :

| No. of returns : | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| No. of stores : | 4 | 14 | 23 | 23 | 18 | 9 | 9 |

Fit a Poisson distribution.

9. (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 and

(ii) at least two defectives. (6)

(b) $X$ is normally distributed and the mean of $X$ is 12 and S.D. is 4. Find the probability of

(i) $X \geq 20$

(ii) $0 \leq X \leq 12$.

10. Obtain the equations of two lines of regression for the following data :

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $X$ : | 65 | 66 | 67 | 67 | 68 | 69 | 70 | 72 |
| $Y$ : | 67 | 68 | 65 | 68 | 72 | 72 | 69 | 71 |

Also obtain the estimate of $X$ for $Y = 70$.

11. (a) The means of two single large of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches?

(Test at 5% level of significance) (5)

(b) Write short notes on

(i) stratified random sampling

(ii) two types of errors. (5)

12. The heights of six randomly chosen sailors are (in inches) : 63, 65, 68, 69, 71 and 72. Those of 10 randomly chosen soldiers are 61, 62, 65, 66, 69, 69, 70, 71, 72 and 73. Discuss, the light that these data throw on the suggestion that soldiers are on the average taller than soldiers.

13. A test was given to 5 students chosen at random from the particular class of each of the three universities in a state. Their scores were found as follows :

| University | Scores | | | | |
|---|---|---|---|---|---|
| *A* | 90 | 70 | 60 | 50 | 80 |
| *B* | 70 | 40 | 50 | 40 | 50 |
| *C* | 60 | 50 | 60 | 70 | 60 |

Perform analysis of variance and show if there is any significant difference between the scores of students in the three universities at a 5% level of significance.

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