

(6 pages)

MAY 2013

P/ID 17406/RBG

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Time : Three hours

Maximum : 75 marks

PART A — (5 × 5 = 25 marks)

Answer ALL questions.

1. (a) The probability that at least 2 of 3 people A, B and C will survive for 10 years is  $\frac{247}{315}$ . The probability that A alone will survive for 10 years is  $\frac{4}{105}$  and the probability that C alone will die within 10 years is  $\frac{2}{21}$ . Assuming that the events of the survival of A, B and C can be regarded as independent, calculate the probability of surviving 10 years for each person.

Or

- (b) A random variable X has the probability function:

Values of  $x$ ,  $x$ :    -2   -1   0   1   2   3

$p(x)$ :                0.1    $k$    0.2    $2k$    0.3    $k$

Find the value of  $k$  and calculate mean and variance.

2. (a) If  $x$  is a Poisson variate such that  $p(x=2) = 9 p(x=4) + 90 p(x=6)$ . Find the mean of  $x$ .

Or

- (b) Define normal distribution. State its any four properties.

3. (a) Fit a parabola of second degree to the following data:

$x:$  0 1 2 3 4

$y:$  1.0 1.8 1.3 2.5 6.3

Or

- (b) Write short notes on partial correlation.

4. (a) The means of two single large samples 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.

Or

- (b) A random sample of 10 boys had the following I.Q.'s = 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. values of samples of 10 boys lie.

5. (a) Below are given the figures of production (in thousand tonnes) of a fertilizer factory.

Year: 1995 1997 1998 1999 2000 2001 2004

Production 77 88 94 85 91 98 90  
(‘000 tonnes):

Fit a straight line by the least square method and tabulate the trend value.

Or

- (b) What are the advantages and disadvantages of randomized block design?

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

6. A factory has 3 machines A, B and producing 1000, 2000 and 3000 bolts per day respectively. A produces 1% defective, B 1.5% and 2% defective. A bolt is checked at random at the end of a day and is found to be defective. What is the probability that it came from machine A.
7. The mileage C is thousands of miles which car owners get with a certain kind of tyre is random variable having probability density function

$$f(x) = \begin{cases} \frac{1}{20} e^{-x/20}, & \text{for } x > 0 \\ 0 & , \text{for } x \leq 0 \end{cases}$$

Find the probabilities that one of these tyres will last.

- (a) at most 10,000 miles
- (b) any where from 16,000 to 24,000 miles
- (c) at least 30,000 miles.

8. (a) If A and B are independent events, then prove that  $\bar{A}$  and  $\bar{B}$  are also independent events. (4)

(b) The mean yield for one-acre plot is 662 kilos with a standard deviation 32 kilos. Assuming normal distribution, how many one-acre plots in a batch of 1000 plots would you expect to have yield.

- (i) Over 700 kilos
- (ii) Below 650 kilos. (6)

9. If  $x$  and  $y$  are two random variables having joint density function

$$f(x, y) = \frac{1}{8}(6 - x - y); 0 < x < 2, 2 < y < 4$$
$$= 0, \text{ otherwise.}$$

Find (i)  $p(x < 1 \text{ and } y < 3)$

(ii)  $p(x + y < 3)$  and

(iii)  $p(x < 1 / y < 3)$ .

10. Seven coins are tossed and number of heads noted. The experiment is repeated 128 times and the following distribution is obtained

No. of heads 0 1 2 3 4 5 6 7

Frequencies 7 6 19 35 30 23 7 1

Fit a binomial distribution by assuming the nature of coin is not known.

11. (a) State the differences between correlation and regression. (4)
- (b) A sample of 12 fathers and their eldest sons gave the following data about their height in inches:

Father: 65 63 67 64 68 62 70 66 68

Son: 68 66 68 65 69 66 68 65 71

Father: 67 69 71

Son: 67 68 70

Calculate the coefficient of rank correlation.

12. Two sample polls of votes for two candidates A and B for a public office are taken, one from among the residents of rural areas. The results are given in the following table. Examine the nature of the area is related to voting preference in this election at 5% level of significance

Votes for \ Area	A	B	Total
Rural	620	380	1000
Urban	550	450	1000
Total	1170	830	2000

13. Yields of 4 varieties of wheat in 3 blocks are given below:

Blocks \ Varieties	1	2	3
I	10	9	8
II	7	7	6
III	8	5	4
IV	5	4	4

Is the difference between varieties significant at 5% level?

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