(6 pages)

MAY 2022 **P/ID 17608/PCAE2**

Time : Three hours Maximum : 80 marks

PART A — ($10 \times 2 = 20$ marks)

Answer any TEN questions.

1. Two unbiased dice are thrown Find the probability that :

   (a) both the dice show the same number;

   (b) the first die shows 6.

2. If $p_1 = P(A)$, $p_2 = P(B)$, $p_3 = P(A \cap B)$, $(p_1, p_2, p_3 > 0)$, express the following in the terms p_1, p_2, p_3

   (a) $P\left(\overline{A \cup B}\right)$,

   (b) $P(\overline{A} \cup \overline{B})$.

3. If $p(x) = \begin{cases} \frac{x}{15} & x = 1,2,3,4 \\ 0, & elsewhere \end{cases}$ Find $P(X = 1 \text{ or } 2)$.

4. Determine the binomial distribution for which the mean is 4 and variance 3.

5. Define exponential distribution.

6. What is regression?

7. Given $n = 1000$, $\bar{x} = 65$, $\bar{y} = 83$, $\sigma_x = 45$, $\sigma_y = 3.6$ and the sum of the product of the deviation from the mean of x and y is 4800. Find the correlation coefficient between x and y.

8. Define sample.

9. What is random sample?

10. Describe point estimation.

11. Write a short note on short term fluctuation.

12. Explain the method of semi average.

PART B — ($5 \times 6 = 30$ marks)

Answer any FIVE questions.

13. A card is drawn from a pack 52 cards. Find the probability of getting a king or a heart or a red card.

14. In four tosses of a coin, let X be the number of heads. Tabulate the 16 possible outcomes with the corresponding values of X. By simple counting, derive the probability distribution of X and hence calculate the expected value of X.

15. The mean yield for one-acre plot is 662 kilos with s.d. 32 kilos. Assuming normal distribution, how many one-acre plots in a batch of 1,000 plots would you expect to have yield (a) over 700 kilos, (b) below 650 kilos, and (c) what is the lowest yield of the best 100 plots?

16. A computer while calculating correlation coefficient between two variable X and Y from 25 pairs of observations obtained the following results : $n = 25$, $\sum X = 125$, $\sum Y = 100$, $\sum X^2 = 650$, $\sum Y^2 = 460$, $\sum XY = 508$. If was, however, later discovered at the time of checking that he had copied down two pairs as (6, 14), (9, 6) while the correct values ere (8, 12), (6, 8). Obtain the correct value of correlation coefficient.

17. A machine is expected to produce nails of length 2 cm. A random sample of 25 nails gave an average length 2.1 cm with s.d. 0.25 cm. Can it be said that the machine is producing nails as per specifications?

18. A random sample of 10 boys has the following I.Q. (Intelligent Quotients) 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100?

19. Compute the trends value by the method of 4 yearly moving average for the data :

Year :	1982	1983	1984	1985	1986	1987
Production :	45	46	44	47	42	41
Year :	1988	1989	1990	1991	1992	
Production :	39	42	45	40	48	

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

20. A random variable X has the following probability function :

x :	0	1	2	3	4	5	6	7
$p(x)$:	0	k	2k	2K	3k	k^2	$2k^2$	$7k^2+k$

(a) Find k,

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

(c) Determine the distribution function of X.

21. The daily consumption of milk in a city, in excess of 20,000 litres, is approximately distributed as a Gamma variate with parameter $a = \frac{1}{10000}$ and $\lambda = 2$. The city has a daily stock of 30,000 litres. What is the probability that the stock is insufficient on a particular day?

22. Obtain the equations of two lines of regression for the following data. Also obtain the estimate of X for $Y = 70$.

X :	65	66	67	67	68	69	70	72
Y :	67	68	65	68	72	72	69	71

23. Two random samples gave the following results.

Sample	Size	Sample mean	Sum of the squares of deviations from the mean
I	10	15	90
II	12	14	108

Test whether the sample could have come from the same normal population.

24. The following table gives the results of experiments on 4 varieties of corps in 5 bocks of plots. Prepare the table of analysis of variance to test the significance of difference between the yields of 4 varieties.

Blocks Varieties	1	2	3	4	5
A	32	34	35	35	37
B	34	33	36	37	35
C	31	34	35	32	36
D	29	26	30	28	29