(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Statistical tables will be provided on **request**.

1. (a) If the tangent of the angle between the two lines of regression is 0·6 and $\sigma_y = 2\sigma_x$, find the coefficient of correlation between x and y.   **5**

(b) What is the chance that a leap year selected at random will contain 53 sundays ?   **5**

(c) The first four moments of a distribution about the value 4 are −1·5, 17, −30 and 108. Calculate the moments about the mean.   **5**

(d) A variable X follows a Poisson distribution with variance 3.   **5**
Calculate — (i) $P(X = 2)$, (ii) $P(X \geq 4)$.

2. (a) Can it be concluded that the average life-span of an Indian is more than 70 years, if a random sample of 100 Indians has an average life span of 71·8 years with standard deviation of 7·8 years ?   **6**

(b) The probability density function of a random variable X is —   **6**

X	:	0	1	2	3	4	5	6
P(X = x)	:	K	3K	5K	7K	9K	11K	13K

find $P(X < 4)$, $P(3 < X \leq 6)$.

(c) Fit a Binomial distribution to the following data :—   **8**

X :	0,	1,	2,	3,	4,	5,	6
f :	5,	18,	28,	12,	7,	6,	4

3. (a) Find the mean and variance of Poisson distribution.   **6**

(b) The means of two random samples of size 9 and 7 are 196·42 and 198·82 respectively. The sum of the squares of the deviation from the means are 26·94 and 18·73 respectively. Can the samples be considered to have been drawn from the same population ?   **6**

(c) Fit a straight line to the following data :—   **8**

Year (x)	:	1951	1961	1971	1981	1991
Production (tons) (y)	:	10	12	8	10	13

Also estimate the production in 1987.

4. (a) Seven dice are thrown 729 times. How many times do you expect at least four dice to show three of five ?   **6**

(b) The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls.   **6**

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(c) Five dice were thrown 192 times and the number of times 4, 5 or 6 were obtained **8**
are as follows :—
　　　No. of dice showing 4, 5, 6 :　5,　4,　3,　2,　1,　0
　　　Frequency　　　　　　　：　6,　46,　70,　48,　20,　2
Calculate χ^2.

5. (a) A continuous random variable has probability density function $f(x) = 6(x - x^2)$, **6**
$0 \leq x \leq 1$.
Find — (i) Mean, (ii) Variance, (iii) Median.

(b) The marks obtained by students in a college are normally distributed with mean **6**
65 and variance 25. If 3 students are selected at random from this college, what
is the probability that at least one of them would have scored more than 75 marks ?

(c) Calculate the rank correlation coefficient from the following data : **8**
　　X :　1,　3,　7,　5,　4,　6,　2,　10,　9,　8
　　Y :　3,　1,　4,　5,　6,　9,　7,　8,　10,　2

6. (a) The regression lines of a sample are $x + 6y = 6$ and $3x + 2y = 10$. Find — **6**
　　(i)　Sample means $\bar{x}$ and $\bar{y}$
　　(ii)　Coefficient of correlation between x and y.

(b) Using normal distribution, find the probability of getting 55 heads in the toss of **6**
100 fair coins.

(c) Ten individuals are chosen at random from a population and their heights are found **8**
to be 63, 63, 64, 65, 66, 69, 69, 70, 70, 71 inches. Discuss the suggestion that
the mean height of the universe is 65 inches.

7. (a) A farmer applies three types of fertilisers on 4 separate plots. The figures on **10**
yield per acre are tabulated as following :—

Fertilisers/Plots	Yield				Total
	A	B	C	D	
Nitrogen	6	4	8	6	24
Potash	7	6	6	9	28
Phosphate	8	5	10	9	32
Total	21	15	24	24	84

Find out if the plots are materially different and also if the fertilisers make any
material difference.
The F value for $V_1 = 3$, $V_2 = 6$ is 4·76 and that for $V_1 = 2$ and $V_2 = 6$ is 5·14 both
at 5% level of significance.

(b) Analysis of variance in following Latin square for yields (in kgs) of wheat where **10** A, B, C, D denotes 4 variety of wheat, rows represent 4 different fertilizers and column account for 4 different yields :—

	1981	1982	1983	1984
t_1	A-70	B-75	C-68	D-81
t_2	D-66	A-59	B-55	C-63
t_3	C-59	D-66	A-39	B-42
t_4	B-41	C-57	D-39	A-55

Examine whether different variety of wheats are responsible for significantly different yield.

(F value for degree of freedom 3 and 6 at 0·05 level of significance is 4·76.)

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