

PROBABILITY AND STATISTICS

Time : 3 hours

Max Marks : 60

Answer all **five** units. (5 x 12 = 60 Marks)**UNIT-I**

1. (a) A random variable
- x
- has the density function

$$P(x) = \begin{cases} kx^2, & 0 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}$$

- Evaluate
- (i) K
 - (ii) $P(1 \leq x < 2)$
 - (iii) $P(x \leq 1)$
 - (iv) mean and variance

- (b) In a certain factory tuning out razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution find the approximate number of packets containing (i) no defective (ii) one defective (iii) two defective blades in a consignment of 10000 packets.

OR

2. (a) State and prove Baye's theorem.
- (b) In an intelligence test administered on 1000 children, the average was 60 a standard deviation of 20. Assuming that the marks obtained by the children follow a normal distribution find the number of children who have scored
- i. more than 90 marks
 - ii. below 40 marks
 - iii. between 50 and 80 marks

UNIT-II

3. (a) Records taken on the number of male and female births in 800 families having for children are as follows.

No. of male births	0	1	2	3	4
No. of female births	4	3	2	1	0
No. of families	32	178	290	236	94

Test whether the data are consistent with the hypothesis that the binomial law holds and the chance of male birth is equal to female birth.

- (b) Define the following terms (i) level of significance (ii) null hypothesis (ii) testing of hypothesis.

OR

4. (a) Two samples of size 8 and 7 gave the sum of the squares of deviations from their respective means equal to 34 and 24 respectively. Test the hypothesis that the population have the same variance from the same population at 5% LOS?
- (b) Two samples of sodium vapour bulbs were tested for length of life and the following results were got:

	Size	Sample mean	Sample SD
Type-I	8	1234hrs	36hrs
Type-II	7	1036hrs	40hrs

Is the difference of means significant to generate that Type-I is superior than Type-II regarding length of life? Test at 5% LOS.

UNIT-III

5. (a) Four doctors each test four treatments for certain disease and observe the number of days each patient takes to recover. The results are as follows(recovery time in days)
- Treatments

Doctor	1	2	3	4
A	10	14	19	20
B	11	15	17	21
C	9	12	16	19
D	8	13	17	20

Discuss the difference between (i) doctors (ii)treatments.

OR

6. (a) Write down the format of the ANOVA table for two factor classification.
- (b) A teacher wishes to teach three different methods I,II,III,IV. To do this three groups of 5 students are chosen at random and each group is taught by different method. A common examination is given to all students and the marks out of 100 scored by them are tabulated below

Method-I	75	62	71	58	73
Method-II	81	85	68	92	90
Method-III	73	79	60	75	81

Determine whether there is a significant difference in teaching methods at 5% LOS and at 1%LOS.

UNIT-IV

7. (a) Explain the procedure to draw x chart and R-chart.
- (b) In a factory producing spark plugs, the number of defectives found in the inspection of 15 lots of 100 each is given below. Draw the control chart for number of defectives and comment on the state of control.

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Np	5	10	12	8	6	4	6	3	4	5	4	7	9	3	4

OR

8. (a) Write a short note on control charts for attributes.
- (b) In a glass factory, the task of quality control was done with the help of mean and standard deviation charts. 18 samples of 10 items each were chosen and then values of $\sum x$ and $\sum S$ were found to be 595.8 and 8.28 respectively. Determine the 3- σ limits for mean and standard deviation chart. Given $n=10, A_1=1.03, B_3=0.28, B_4=1.72, \sum S = 8.28$.

UNIT-V

9. (a) Obtain the angle between the lines of regression.
- (b) The equations of two lines of regression are $3x + 12y = 19, 3y + 9x = 46$. Find (i) the means of x and y . (ii) regression coefficients b_{xy} and b_{yx} . (iii) correlation coefficient between x and y .

OR

10. (a) Fit a curve of the form $y = a + bx + cx^2$ for below data

x	0	1	2	3	4
y	1	1.8	1.3	2.5	2.3

- (b) Find the rank correlation for the data given below,

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70
