

B.E. / B.Tech. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester-IV  
**SE201 - Mathematics-III (Probability and Statistics)**

P. Pages : 3



GUG/S/25/13856

Time : Three Hours

Max. Marks : 80

Notes : 1. All questions are compulsory.  
2. All questions carry equal marks.  
3. Assume suitable data wherever necessary.  
4. Use of non-programmable calculator is permitted.

1. a) Let  $X$  be a random variable giving the number of aces in a random draw of four cards from a pack of 52 cards. Find the probability function and the distribution function for  $X$ . 8

- b) A random variable  $X$  has the density function

$$X = \frac{c}{x^2 + 1} \text{ where } -\infty < x < \infty \text{ find}$$



OR

2. a) A random variable  $X$  has density function

$$f(x) = \begin{cases} kx^2, & 1 \leq x \leq 2 \\ kx, & 2 \leq x \leq 3 \text{ and} \\ 0, & \text{otherwise} \end{cases}$$

**Find:**

- i) Constant k
  - ii)  $P(1 < x < 3)$
  - iii)  $P(2 < x < 3)$
  - iv) The distribution function

- b) An urn holds 5 white and 3 black marbles. If two marbles are drawn randomly without replacement and  $X$  denotes the number of white marbles. Find the probability function and the distribution function. 8

- 3.** a) The Probability distribution function of a random variable  $X$  is given by

$$F(x) = \begin{cases} 1 - \frac{4}{x^2}, & x > 2 \\ 0, & x \leq 2 \end{cases}$$

- i) Probability density function of X
  - ii)  $P(x < 3)$
  - iii)  $P(1 < x < 5)$

- b) The chance of a doctor A will diagnose disease X correctly is 60%. The chance of that patient will die by his treatment. After correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor A who had Disease X died. What is the chance that his disease was diagnosed correctly.

OR

4. a) Out of 2000 families with 4 children each how many would you expect to have (i) atleast one boy (ii) 2 boys (iii) 1 or 2 girls (iv) No girls. 8

- b) In a certain city, the daily consumption of water (in millions of liters) follows approximately a gamma. Distribution with  $\alpha = 2, \beta = 3$ . If the daily capacity of the city is 9 million liters of water. What is the probability that on any given day the water supply is inadequate. 8

5. a) Find the mean, variance and moment generating function for Exponential distribution. 8

$$f(x) = \begin{cases} \alpha e^{-\alpha x}, & x > 0 \\ 0 & x \leq 0 \end{cases}$$

- b) Find the coefficient of 8  
 i) Skewness  
 ii) Kurtosis for the distribution with density function

$$f(x) = \begin{cases} \lambda e^{-\lambda x}, & x \geq 0 \\ 0 & , x < 0 \end{cases}$$

**OR**

6. a) Let X and Y have density function. 8

$$f(x+y) = \begin{cases} x+y, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0 & , \text{ otherwise} \end{cases}$$

Find the conditional expectation and variance of Y given X.

- b) Find the probability of getting a total of 7 8  
 i) At least once  
 ii) At the most twice in the five tosses of a pair of fair dice.

7. a) Find the coefficient of regression and the coefficient of correlation for the following data. 8

x	2	4	5	6	8	11
y	18	12	10	8	7	5

- b) Find the method of least squares, find the straight line that best fits the following data. 8

x	1	2	3	4	5
y	14	27	40	55	68

**OR**

8. a) Find the value of a, b, c so that  $y = a + bx + cx^2$  is the Best fit to the data 8

x	0	1	2	3	4
y	1	0	3	10	21

- b) Use the least-square method to obtain a parabola that approximates the data.

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x	1.0	1.2	1.4	1.6	1.8	2
y	2.345	2.419	2.592	2.863	3.233	3.702

9. a) In 200 tosses of coin 115 heads and 85 tails were observed. Test the hypothesis that the coin is fair using a level of significance of (a) 0.05, (b) 0.01, (c) find the P value of the test.

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- b) Out of 400 children, 150 are found to be under weight. Assuming the condition of simple sampling estimate the percentage of children who are underweight in and assign limits within which the percentage probably lies.

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**OR**

10. a) A coin that is tossed 6 times comes up heads 6 times. Can we conclude at (a) 0.05, (b) 0.01 significance level. That the coin is not fair? Consider both a one tailed and a two tailed test.

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- b) Verify whether Poisson distribution can be assumed from the data given below-

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No. of defects	0	1	2	3	4	5
Frequency	6	13	13	8	4	3

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