

**ANURAG Engineering College**  
(An Autonomous Institution)

II B.Tech I Semester Regular/Supplementary Examinations, December–2024

**PROBABILITY AND STATISTICS**  
(COMMON TO CIVIL, CSE, IT & AIML)

**Time: 3 Hours**

**Max. Marks: 60**

**Section – A (Short Answer type questions)**

**(10 Marks)**

**Answer All Questions**

|   | Course Outcome | B.T Level | Marks |
|---|----------------|-----------|-------|
| 1. State Multiplication theorem on Probability.   | CO1            | L1        | 1M    |
| 2. If two dice are rolled at a time then what is the probability of getting the sum is 8? | CO1            | L2        | 1M    |
| 3. What is the mean of Binomial distribution?   | CO2            | L1        | 1M    |
| 4. State Chebyshev's theorem.   | CO2            | L1        | 1M    |
| 5. Write any two properties of normal curve?  | CO3            | L1        | 1M    |
| 6. Draw all the samples of size 3 from {1,2,3,4} without replacement.                     | CO3            | L2        | 1M    |
| 7. Write the Z - test formula for two proportions.  | CO4            | L1        | 1M    |
| 8. What is the standard error of point estimate?  | CO4            | L1        | 1M    |
| 9. Define transition probability matrix.  | CO5            | L1        | 1M    |
| 10. Define Markov chain.  | CO5            | L1        | 1M    |

**Section B (Essay Questions)**

**Answer all questions, each question carries equal marks.**

**(5 X 10M = 50M)**

11. A) In a certain assembly plant, three machines  $B_1, B_2, B_3$ , make 35%, 45% and 25% respectively, of the products. It is known that 2%, 3% and 2% of the products made by each machine, respectively, are defective. Now suppose that a finished product is randomly selected. i) What is the probability that it is defective? ii) If the product selected is found to be defective what is the probability that it was made by machine is  $B_3$ .
- OR**
- B) Consider the density function
- $$f(x) = \begin{cases} k\sqrt{x}, & 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$$
- i) Evaluate k.  
ii) Evaluate  $P(0.3 < X < 0.6)$  using the density function  
iii) Find  $F(x)$  and use it to evaluate  $P(0.3 < X < 0.6)$ .
12. A) In a testing a certain kind of truck tire over a rugged terrain, it is found that 25% of the trucks fail to complete the test run without a blowout. Of the next 15 trucks tested, what is the probability that  
i) from 3 to 6 have blowouts ii) fewer than 4 have blowouts  
iii) more than 5 blowouts.

**OR**

- B) In the inspection of tin plate produced by a continuous electrolytic process, 0.2 imperfections is spotted per minute, on average. Find the probabilities of spotting
- One imperfection in 3 minutes
  - at least two imperfections in 5 minutes
  - at most one imperfection in 15 minutes
- CO2 L3 10M
13. A) In a test on 2000 electric bulbs it was found that the life of a particular make was normally distributed with an average life of 2040 hours and S.D. of 60 hours. estimate the number of bulbs likely to burn for
- more than 2150 hours
  - less than 1950 hours
  - more than 1920 hours and less than 2160 hours.
- CO3 L3 10M
- OR**
- B) A population consists of five numbers 2,3,4,6,8. Consider all possible samples of size 2 that can be taken without replacement from this population find
- mean of the sampling distributions means
  - standard deviation of sampling distributions means
- CO3 L3 10M
14. A) A random sample of 1000 people from a village shows that their mean wage is Rs.400 per day with a standard deviation of Rs.10. A sample of 1100 people from another village shows that their mean wage is Rs.405 per day with a standard deviation of Rs.11. Does the mean rate of wages differ significantly between the two villages?
- CO4 L3 10M
- OR**
- B) In a city A, 20% of a random sample of 900 school boys had a certain slight physical defect. In another group B, 18.5% of random sample of 1600 school boys had the same defect. Is the difference between the proportions significant at 0.05 level of significance.
- CO4 L3 10M
15. A) The transition probability matrix of a Markov chain  $\{X_n, n=1,2, \dots\}$  having three states 1, 2 and 3 is  $P = \begin{bmatrix} 0.2 & 0.2 & 0.6 \\ 0.7 & 0.2 & 0.1 \\ 0.1 & 0.6 & 0.3 \end{bmatrix}$  and the initial distribution is  $\Pi_0 = (0.6, 0.3, 0.1)$ . Find
- $\Pr\{X_2 = 3\}$
  - $\Pr\{X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2\}$ .
- CO5 L3 10M
- OR**
- B) A salesman territory consists of cities A, B and C. He never sells in the same city on successive days. If he sells in city A, then the next day he sells in city B. However, if he sells in either B or C, then the next day he is twice as likely to sell in city A as in other city. In the long run how often does he sell in each cities.
- CO5 L3 10M