



**B.Tech III Semester Supplementary Examinations, February 2024**

**PROBABILITY & STATISTICS**  
 (Common to CE,ME,CSE, & IT )

**Maximum Marks: 70**

**Date: 16.02.2024 Duration: 3 hours**

- Note:**
1. This question paper contains two parts A and B.
  2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
  4. Each question carries 10 marks and may have a, b, c, d as sub questions.

**Part-A**

| All the following questions carry equal marks (10X2M=20 Marks) |                                                                        | CO  | BTL |
|----------------------------------------------------------------|------------------------------------------------------------------------|-----|-----|
| 1                                                              | Explain distribution function of random variable                       | CO1 | L2  |
| 2                                                              | Explain expected value and variance of random variable                 | CO1 | L2  |
| 3                                                              | Define Poisson distribution                                            | CO2 | L1  |
| 4                                                              | Define Normal distribution                                             | CO2 | L1  |
| 5                                                              | What are the normal equations for straight line                        | CO3 | L1  |
| 6                                                              | What are the normal equations for exponential curve                    | CO3 | L1  |
| 7                                                              | Explain the terms Hypothesis, Null hypothesis and Alternate hypothesis | CO4 | L2  |
| 8                                                              | Explain (i) Statistical Hypothesis, (ii) Level of significance         | CO4 | L2  |
| 9                                                              | Define one tailed test                                                 | CO5 | L1  |
| 10                                                             | Explain the terms Type I & Type II Error?                              | CO5 | L2  |

**Part-B**

| Answer All the following questions. (5X10M=50Marks)                                                                                                                                         |                                                                                                                                                                                      |    |    |                |                 |     | CO  | BTL |   |   |   |          |   |    |    |                |                 |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|----------------|-----------------|-----|-----|-----|---|---|---|----------|---|----|----|----------------|-----------------|--|--|--|
| 11                                                                                                                                                                                          | A random variable X has the following distribution                                                                                                                                   |    |    |                |                 | 10M | CO1 | L3  |   |   |   |          |   |    |    |                |                 |  |  |  |
| <table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>P(X = x)</td><td>K</td><td>2K</td><td>2K</td><td>K<sup>2</sup></td><td>5K<sup>2</sup></td></tr></table> |                                                                                                                                                                                      |    |    |                |                 | X   | 0   | 1   | 2 | 3 | 4 | P(X = x) | K | 2K | 2K | K <sup>2</sup> | 5K <sup>2</sup> |  |  |  |
| X                                                                                                                                                                                           | 0                                                                                                                                                                                    | 1  | 2  | 3              | 4               |     |     |     |   |   |   |          |   |    |    |                |                 |  |  |  |
| P(X = x)                                                                                                                                                                                    | K                                                                                                                                                                                    | 2K | 2K | K <sup>2</sup> | 5K <sup>2</sup> |     |     |     |   |   |   |          |   |    |    |                |                 |  |  |  |
| Determine the value of k, mean and variance                                                                                                                                                 |                                                                                                                                                                                      |    |    |                |                 |     |     |     |   |   |   |          |   |    |    |                |                 |  |  |  |
| OR                                                                                                                                                                                          |                                                                                                                                                                                      |    |    |                |                 |     |     |     |   |   |   |          |   |    |    |                |                 |  |  |  |
| 12                                                                                                                                                                                          | If the probability density function of a random variable is given by<br>$f(x) = \begin{cases} k(1-x^2), & 0 < x < 1 \\ 0 & \text{Otherwise} \end{cases}$<br>find k mean and variance |    |    |                |                 | 10M | CO1 | L3  |   |   |   |          |   |    |    |                |                 |  |  |  |
| 13                                                                                                                                                                                          | A. A discrete random variable X has the mean 6 and variance 2. If it is assumed that the distribution is Binomial find the probability that<br>$5 \leq x \leq 7$                     |    |    |                |                 | 5M  | CO2 | L3  |   |   |   |          |   |    |    |                |                 |  |  |  |

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |     |     |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|-----|-----|-----|-----|-----|-----------------|----|----|-------------|----|----|----|----------|------------|----------|----|---|----|----------|------------|----------|
|                 | B. Determine the probability that 2 of 100 books bound will be defective if it is known that 5% of books bound at this bindery are defective use Poisson distribution                                                                                                                                                                                                                                                                                                                        | 5M      | CO2 | L3  |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
|                 | OR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |     |     |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| 14              | The waist measurement of 800 girls are normally distributed with mean 66 cm and standard deviation 5 cm. Examine the number of girls with waist<br>(i) Between 65 cm and 70 cm<br>(ii) Greater than equal to 72 cm                                                                                                                                                                                                                                                                           | 10M     | CO2 | L4  |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| 15              | A. Define correlation and regression with suitable examples<br>B. The scores for nine students in physics and math are as follows<br><table><tr><td>Physics</td><td>35</td><td>23</td><td>47</td><td>17</td><td>10</td><td>43</td><td>9</td><td>6</td><td>28</td></tr><tr><td>Mathematics</td><td>30</td><td>33</td><td>45</td><td>23</td><td>8</td><td>49</td><td>12</td><td>4</td><td>31</td></tr></table><br>Compute the Spearman rank correlation.                                       | Physics | 35  | 23  | 47  | 17  | 10  | 43  | 9               | 6  | 28 | Mathematics | 30 | 33 | 45 | 23       | 8          | 49       | 12 | 4 | 31 | 5M<br>5M | CO3<br>CO3 | L3<br>L3 |
| Physics         | 35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 23      | 47  | 17  | 10  | 43  | 9   | 6   | 28              |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| Mathematics     | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 33      | 45  | 23  | 8   | 49  | 12  | 4   | 31              |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
|                 | OR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |     |     |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| 16              | Fit second order parabola to the following data<br><table><tr><td>x</td><td>12</td><td>10</td><td>8</td><td>6</td><td>4</td><td>2</td></tr><tr><td>y</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr></table>                                                                                                                                                                                                                                                           | x       | 12  | 10  | 8   | 6   | 4   | 2   | y               | 6  | 5  | 4           | 3  | 2  | 1  | 10M      | CO3        | L3       |    |   |    |          |            |          |
| x               | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10      | 8   | 6   | 4   | 2   |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| y               | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 5       | 4   | 3   | 2   | 1   |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| 17              | An oceanographer wants to check whether the depth of the ocean in certain region is 57.4 fathoms, as had provisory (fully worked out) been recorded. What can he conclude at the 0.05 level of significance, if reading taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with a standard deviation of 5.2 fathoms?                                                                                                                                            | 10M     | CO4 | L3  |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
|                 | OR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |     |     |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| 18              | A man buys 50 electrical light bulbs of Philips and 50 HMT bulbs. He finds that Philips bulbs have an average life of 1500 hours with standard deviation of 60 hours and HMT bulbs have an average life of 1512 hours with standard deviation of 80 hours. Is there significant difference in the mean life of two makes of bulbs?                                                                                                                                                           | 10M     | CO4 | L3  |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| 19              | A. Explain $\chi^2$ – test of independence of attributes<br>B. The following table gives the number of aircraft accidents that occurred during the six days of the week. Find whether the accidents are uniformly distributed over the week at 5% level of significance?<br><table><tr><td>Days</td><td>Mon</td><td>Tue</td><td>Wed</td><td>Thu</td><td>Fri</td><td>Sat</td></tr><tr><td>No of accidents</td><td>14</td><td>18</td><td>12</td><td>11</td><td>15</td><td>14</td></tr></table> | Days    | Mon | Tue | Wed | Thu | Fri | Sat | No of accidents | 14 | 18 | 12          | 11 | 15 | 14 | 5M<br>5M | CO5<br>CO5 | L3<br>L3 |    |   |    |          |            |          |
| Days            | Mon                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Tue     | Wed | Thu | Fri | Sat |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| No of accidents | 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 18      | 12  | 11  | 15  | 14  |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
|                 | OR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |     |     |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |
| 20              | A random sample of size 16 has the sample mean 53. The sum of the squares of the deviation taken from the mean value is 150. Can this sample be regarded as taken from the population having 56 as its mean? Obtain 95% limits of the sample mean.                                                                                                                                                                                                                                           | 10M     | CO5 | L3  |     |     |     |     |                 |    |    |             |    |    |    |          |            |          |    |   |    |          |            |          |