

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2025)**

**CLASS: BTECH
BRANCH: AIML**

**SEMESTER: IV
SESSION: SP/2025**

SUBJECT: AI201 PROBABILITY AND STATISTICAL ANALYSIS

TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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|--------|---|-----|-----|----|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|--|--|
| | | | CO | | BL | | | | | | | | | | | | | | | | | | | | |
| Q.1(a) | What do you mean by “Population” and “Sample”? Explain the significance of samples. | [2] | CO1 | | BL1S | | | | | | | | | | | | | | | | | | | | |
| Q.1(b) | The sample mean and sample variance of five data values are, respectively, $\bar{x}=104$ and $s^2 =16$. If three of the data values are 102, 100, 105, what are the other two data values? | [3] | CO1 | | BL1
BL2
BL3 | | | | | | | | | | | | | | | | | | | | |
| Q.2(a) | Of three cards, one is painted red on both sides; one is painted black on both sides; and one is painted red on one side and black on the other. A card is randomly chosen and placed on a table. If the side facing up is red, what is the probability that the other side is also red? | [2] | CO2 | | BL3
BL4 | | | | | | | | | | | | | | | | | | | | |
| Q.2(b) | It is estimated that 50% of emails are spam emails. Some software has been applied to filter these spam emails before they reach your inbox. A certain brand of software claims that it can detect 99% of spam emails, and the probability for a false positive (a non-spam email detected as spam) is 5%. Now if an email is detected as spam, then what is the probability that it is in fact a non-spam email? | [3] | CO2 | | BL3
BL4 | | | | | | | | | | | | | | | | | | | | |
| Q.3 | The following data relates to the yield in grams(y) and the matured pods (x) of 9 groundnut plants. Find out the Pearson’s correlation coefficient. | [5] | CO1 | | BL1
BL2
BL3 | | | | | | | | | | | | | | | | | | | | |
| | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">X:</td> <td style="padding: 2px;">14</td> <td style="padding: 2px;">34</td> <td style="padding: 2px;">20</td> <td style="padding: 2px;">16</td> <td style="padding: 2px;">11</td> <td style="padding: 2px;">20</td> <td style="padding: 2px;">17</td> <td style="padding: 2px;">13</td> <td style="padding: 2px;">14</td> </tr> <tr> <td style="padding: 2px;">Y:</td> <td style="padding: 2px;">16</td> <td style="padding: 2px;">40</td> <td style="padding: 2px;">21</td> <td style="padding: 2px;">18</td> <td style="padding: 2px;">12</td> <td style="padding: 2px;">15</td> <td style="padding: 2px;">20</td> <td style="padding: 2px;">22</td> <td style="padding: 2px;">17</td> </tr> </table> | X: | 14 | 34 | 20 | 16 | 11 | 20 | 17 | 13 | 14 | Y: | 16 | 40 | 21 | 18 | 12 | 15 | 20 | 22 | 17 | | | | |
| X: | 14 | 34 | 20 | 16 | 11 | 20 | 17 | 13 | 14 | | | | | | | | | | | | | | | | |
| Y: | 16 | 40 | 21 | 18 | 12 | 15 | 20 | 22 | 17 | | | | | | | | | | | | | | | | |
| Q.4 | A manufacturer produces light-bulbs that are packed into boxes of 100. If quality control studies indicate that 0.5% of the light-bulbs produced are defective, what percentage of the boxes will contain:
(a) no defective?
(b) 2 or more defectives? | [5] | CO2 | | BL3
BL4 | | | | | | | | | | | | | | | | | | | | |
| Q.5 | Let X represent the difference between the number of heads and the number of tails obtained when a coin is tossed n times. What are the possible values of X? | [5] | CO2 | | BL3
BL4
BL5 | | | | | | | | | | | | | | | | | | | | |

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