NARSIMHA REDDY ENGINEERING COLLEGE
UGC AUTONOMOUS INSTITUTION
Maisammaguda (V), Kompally - 500100, Secunderabad, Telangana State, India
UGC - Autonomous Institute
Accredited by NBA & NAAC with 'A' Grade
Approved by AICTE
Permanently affiliated to JNTUH

## CIVIL

## QUESTION BANK

**Course Title** : PROBABILITY AND STATISTICS

**Course Code** : 23MA302

**Regulation** : NR23

**Course Objectives**: To learn The theory of Probability, and probability distributions of single and multiple random variables• The sampling theory and testing of hypothesis and making statistical inferences•

**Course outcomes**: After learning the contents of this paper the student must be able to

1. Apply the concepts of probability and distributions to some case studies.
2. Distinguish between discrete and continuous probability distributions.
3. Formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.
4. Apply the concept of estimation and testing of hypothesis to case studies.
5. Estimate the correlation and regression values for the given data.

# UNIT–I

## PROBABILITY, RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS

| S.No | Questions | BT | CO | PO |
|---|---|---|---|---|
| | **Part – A (Short Answer Questions)** | | | |
| 1 | Define sample space. | L1 | CO1 | PO1 |
| 2 | Define pairwise independent events. | L1 | CO1 | PO2 |
| 3 | Define conditional probability. | L3 | CO1 | PO1 |
| 4 | State addition theorem for two events. | L3 | CO1 | PO2 |
| 5 | Write mean formula for continuous variable. | L1 | CO1 | PO2 |
| 6 | What is the probability that a card drawn at random from the pack of playing cards may be either a king or queen. | L3 | CO1 | PO1 |
| 7 | Given that $f(x) = \frac{k}{2x}$, is a probability distribution for a random variable X that can take values x=0,1,2,3,4. Find k. | L3 | CO1 | PO1 |
| 8 | Write the properties of probability density function f(x). | L1 | CO1 | PO1 |
| 9 | What is the probability for a leap year to have 52 Mondays and 53 Sundays? | L2,L3 | CO1 | PO2 |
| 10 | In a single throw with two dice find the probability of throwing a sum 8. | L3 | CO1 | PO2 |

| | | | | | |
|---|---|---|---|---|---|
| | **Part – B (Long Answer Questions)** | | | | |
| 11 | a) | State and prove Bayes theorem. | L1 | CO1 | P01 |
| | b) | Three machines A, B, C produce 40%,30%,30% of the total number of items of factory. The percentages of defective items of these machines are 4%,2%,3%. If an item is selected at random, which is found to be defective. What is the probability that it is from<br>1) Machine A ii. Machine B iii. Machine C. | L1,L3 | CO1 | P02 |
| 12 | a) | A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number E of defective items. | L3,L4 | CO1 | PO1 |

| | | | | | |
|---|---|---|---|---|---|
| | b) | Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. If a marble is drawn from each box, what is the probability that they are both of same colour. | L2,L4 | CO1 | PO2 |
| 13 | | A continuous random variable has the probability density function $f(x) = \begin{cases} kxe^{-\lambda x}, for\ x \geq 0, \lambda > 0 \\ 0, otherwise \end{cases}$<br>Determine<br>i. K<br>ii. Mean<br>iii. variance | L3,L4 | CO1 | PO1 |
| 14 | a) | In a certain town 40% have brown hair, 25% have brown eyes and 15% have both brown hair and brown eyes, a person is selected at random from the town.<br>i. If he has brown hair, what is the probability that he has brown eyes also?<br>ii. If he has brown eyes, determine the probability that he does not have brown hair? | L3,L4 | CO1 | PO2 |
| | b) | Three students A ,B, and C are in a running race. A and B have the same probability of winning and each is twice as likely to win as C. find the probability that B or C wins. | L3,L4 | CO1 | PO2 |
| 15 | a) | Two aeroplane's bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability that<br>i. Target is hit<br>ii. Both fails to score hits | L2,L4 | CO1 | PO1 |
| | b) | Suppose a continuous random variable X has the probability density $f(x) = k(1 - x^2)\ for\ 0 < x < 1$ and f(x)=0 otherwise. Find<br>i. k<br>ii. Mean | L2,L4,L5 | CO1 | PO2 |
| 16 | | A random variable X has the following probability function<br>X: -3, -2, -1, 0, 1, 2, 3<br>P(X): k, 0.1, k, 0.2, 2k, 0.4, 2k<br>Find<br>i. k<br>ii. Mean | L3,L5 | C01 | PO1 |

Table for question 16:

| X | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| P(X) | k | 0.1 | k | 0.2 | 2k | 0.4 | 2k |

| | | | | | |
|---|---|---|---|---|---|
| | | iii. Variance<br>iv. $P(X\geq1)$<br>v. $P(-2<X<2)$ | | | |

## UNIT–II

## MATHEMATICAL EXPECTATIONS AND DISCRETE PROPABIBLITY DISTRIBUTIONS

| S. No | Questions | BT | CO | PO |
|---|---|---|---|---|
| **Part – A (Short Answer Questions)** | | | | |
| 1 | Define expectation of a random variable X | L1 | CO2 | PO1 |
| 2 | Define variance of a random variable X for discrete and continuous cases. | L1 | CO2 | PO1 |
| 3 | Let X be a random variable with density function $f(x) = \begin{cases} \frac{x^3}{3}, & -1 < x < 2 \\ 0, \textit{else where} \end{cases}$ Find the expected value of f(x). | L3 | CO2 | PO2 |
| 4 | Let the random variable X represent the number of defective parts for a machine when 3 parts are sampled from a production line and tested. The following is the probability distribution of X.<br>X: 0, 1, 2, 3<br>F(x): 0.51, 0.38, 0.10, 0.01<br>Calculate E(X) | L3 | CO2 | PO2 |
| 5 | 20% of item produced from a factory are defective. Find the probability that in a sample of 5 chosen at random $P(1<x<4)$. | L3 | CO2 | PO2 |
| 6 | If the probability of a defective bolt is 0.2 find the mean and variances of the number of successes. | L3 | CO2 | PO2 |
| 7 | Define geometric distribution. | L1 | CO2 | PO1 |
| 8 | If a random variable has a Poisson distribution such that P(1) =P(2), find mean of the distribution. | L3 | CO2 | PO2 |
| 9 | Using Poisson distribution, find the probability that the ace of spades will be drawn from a pack of well shuffled cards at least once in 104 consecutive trials. | L3 | CO2 | PO2 |
| 10 | In 256 set of 12 tosses of a coin, in how many cases one can expect 8 heads and 4 tails. | L3 | CO2 | PO2 |
| **Part – B (Long Answer Questions)** | | | | |

<table>
<tr><td>11</td><td></td><td>Seven coins are tossed and the number of heads are noted. The experiment is repeated 128 times and the following distribution is obtained. Fit a Binomial Distribution to the following data assuming the coin is unbiased<br><table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>f</td><td>7</td><td>6</td><td>19</td><td>35</td><td>30</td><td>23</td><td>7</td><td>1</td></tr></table></td><td>L3,L5</td><td>CO2</td><td>PO3</td></tr>
<tr><td rowspan="2">12</td><td>a)</td><td>Using recurrence formula find the probabilities when X=0,1,2,3,4 and 5, if the mean of Poisson distribution is 3.</td><td>L3,L5</td><td>CO2</td><td>PO3</td></tr>
<tr><td>b)</td><td>If the probability that an individual suffers a bad reaction from a certain injection is 0.001, determine the probability that out of 2000 individuals<br>i. Exactly 3<br>ii. More than 2 individuals<br>iii. None<br>iv. More than one individual suffers bad reaction</td><td>L3</td><td>CO2</td><td>PO2</td></tr>
<tr><td rowspan="2">13</td><td>a)</td><td>A die is tossed until 6 appears. Find the probability that it must be cast more than 5 times.</td><td>L1</td><td>CO2</td><td>PO1</td></tr>
<tr><td>b)</td><td>A lot containing 7 components is sampled by a quality inspector. The lot contains 4 good components and 3 defective components. A sample of 3 items is taken by the inspector. Find the expected values of the number of good components in the sample.</td><td>L3</td><td>CO2</td><td>PO2</td></tr>
<tr><td>14</td><td></td><td>Out of 800 families with 5 children each, how many would you expect to have<br>a. 3boys<br>b. 5girls<br>c. At least one boy<br>d. Mean<br>e. Variance</td><td>L3,L4,L5</td><td>CO2</td><td>PO3</td></tr>
<tr><td rowspan="2">15</td><td>a)</td><td>Derive variance of Poisson distribution</td><td>L1</td><td>CO2</td><td>PO1</td></tr>
<tr><td>b)</td><td>A die is tossed until 6 appears. Find the probability that it must be cast more than 5 times.</td><td>L2</td><td>CO2</td><td>PO2</td></tr>
<tr><td rowspan="2">16</td><td>a)</td><td>If a Poisson Distribution is such that $\frac{3}{2}P(X = 1) = P(X = 3)$. Find<br>i. P(X≥1)<br>ii. P(X≤3)</td><td>L2</td><td>CO2</td><td>PO2</td></tr>
<tr><td>b)</td><td>Calculate the variance of g(X)=2X + 3, where X is a random variable with the following probability</td><td>L3</td><td>CO2</td><td>PO2</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| | | distribution | | | |

| x | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| F(x) | 1/4 | 1/8 | 1/2 | 1/8 |

## UNIT–III

## CONTINUOUS DISTRIBUTIONS AND SAMPLING AND FUNDAMENTAL SAMPLING DISTRIBUTIONS

| S.No | | Questions | BT | CO | PO |
|---|---|---|---|---|---|
| **Part – A (Short Answer Questions)** | | | | | |
| 1 | | State the conditions under which Normal distribution is a limiting case of Binomial. | L1 | CO3 | PO1 |
| 2 | | If X is a Normal variate with mean 30 and standard deviation 5. find P(26≤X≤40). | L2 | CO3 | PO2 |
| 3 | | Define Normal distribution. | L1 | CO3 | PO1 |
| 4 | | Define statistic and parameter. | L1 | CO3 | PO1 |
| 5 | | Find the value of the finite population correction factor for n=10 and N=100. | L3 | CO3 | PO2 |
| 6 | | How many different samples of size 2 can be chosen from a finite population of size 25. | L3 | CO3 | PO2 |
| 7 | | Write the test statistic for F-distribution | L1 | CO3 | PO1 |
| 8 | | The variance of a population is 2. The size of the sample collected from the population is 169. What is the standard error of mean. | L3 | CO3 | PO2 |
| 9 | | Write test statistic for t- distribution for difference of mean. | L3 | CO3 | PO2 |
| 10 | | State central limit theorem. | L3 | CO3 | PO2 |
| **Part – B (Long Answer Questions)** | | | | | |
| 11 | a) | If X is a Normal variate with mean 30 and standard deviation 5. Find the probabilities that<br>i. 26≤X≤40<br>ii. X≥45 | L4,L5 | CO3 | PO3 |
| | b) | If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3kgs how many students have masses<br>i. Greater than 72kgs<br>ii. Less than or equal to 64 kgs | L2,SL3 | CO3 | PO3 |
| 12 | a) | A sample of 26 bulbs gives a mean life of 990 hours with a standard deviation of 20 hours. The manufacturer claims that the mean of bulbs is 1000hrs. is the sample not up to standard | L3 | CO3 | PO2 |
| | b) | The means of two random samples of sizes 9 and 7 are | L3 | CO3 | PO2 |

<table>
<tr><td></td><td></td><td>196.42 and 198.82 respectively. The sum of the squares of the deviations from the mean are 26.94 and 18.73 respectively. Can the sample be considered to have been from the same normal population</td><td></td><td></td><td></td></tr>
<tr><td>13</td><td>a)</td><td>Memory capacity of 10 students were tested before and after training
<table>
<tr><td>Before</td><td>12</td><td>14</td><td>11</td><td>8</td><td>7</td><td>10</td><td>3</td><td>0</td><td>5</td><td>6</td></tr>
<tr><td>After</td><td>15</td><td>16</td><td>10</td><td>7</td><td>5</td><td>12</td><td>10</td><td>2</td><td>3</td><td>8</td></tr>
</table>
Test whether the intensive training is useful at 5% level of significance.</td><td>L4,L5<br>L3</td><td>CO3<br>CO3</td><td>PO1<br>PO2</td></tr>
<tr><td>14</td><td></td><td>In a normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution</td><td>L4,L5</td><td>CO3</td><td>PO1</td></tr>
<tr><td>15</td><td></td><td>A population consists of five numbers 2,3,6,8,11. Consider all possible samples of size two which can be drawn with replacement from this population. Find<br>i. The mean of the population.<br>ii. The standard deviation of the population.<br>iii. The mean of sampling distributions of means and<br>iv. The standard deviation of the sampling distributions of means.</td><td>L4,L2</td><td>CO3</td><td>PO2</td></tr>
<tr><td>16</td><td>a)</td><td>In one sample of 10 observations from a normal population the sum of the squares of the deviations of the sample values from the sample mean is 102.4 and in other sample of 12 observations from another normal population, the sum of the squares of the deviations of the sample values from the sample mean is 120.5. Examine whether the two normal populations have the same variance.</td><td>L3,L4</td><td>CO3</td><td>PO1</td></tr>
<tr><td></td><td>b)</td><td>A random sample of 10 boys had the following I.Q’s 70,120,110,101,83,88,95,98,107 and 100. Do these data support the assumption of a population mean I’Q of 100.</td><td>L4</td><td>CO3</td><td>PO2</td></tr>
</table>

## UNIT–IV

## ESTIMATION & TESTS OF HYPOTHESES AND STATISTICAL HYPOTHESES

| S.No | Questions | BT | CO | PO |
|---|---|---|---|---|
| | **Part – A (Short Answer Questions)** | | | |
| 1 | Define Type-I. | L1 | CO4 | PO1 |
| 2 | Define critical region. | L1 | CO4 | PO1 |
| 3 | Explain Null and Alternative Hypothesis. | L4 | CO4 | PO1 |
| 4 | Write Standard error formula for Method of Pooling in Proportions. | L1 | CO4 | PO1 |
| 5 | The mean and standard deviation of a population are | L3 | CO4 | PO1 |

<table>
<tr><td colspan="2"></td><td>11795 and 14054 respectively. If n=50, find 95% confidence interval for the mean.</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">6</td><td>A die is tossed 256 times and it turns up with an even digit 150 times. If the die is biased find the test statistic value.</td><td>L3</td><td>CO4</td><td>PO1</td></tr>
<tr><td colspan="2">7</td><td>If $n = 400, \bar{x} = 40, \mu = 38, \sigma = 10$ then find the 95% confidence limits for the population.</td><td>L1</td><td>CO4</td><td>PO1</td></tr>
<tr><td colspan="2">8</td><td>Define type-II error.</td><td>L2,L3</td><td>CO4</td><td>PO1</td></tr>
<tr><td colspan="2">9</td><td>Given $n_1 = 1200, n_2 = 900, P_1 = 0.3, P_2 = 0.25$ then find the test statistic value for difference of two proportions of large samples.</td><td>L2</td><td>CO4</td><td>PO1</td></tr>
<tr><td colspan="2">10</td><td>Define Level of Significance.</td><td>L1</td><td>CO4</td><td>PO1</td></tr>
<tr><td colspan="6"><b>Part – B (Long Answer Questions)</b></td></tr>
<tr><td>11</td><td>a)</td><td>An ambulance service claims that it takes on the average less than 10 mins to reach its destination in emergency calls a sample of 36 calls has a mean of 11 mins and the variance of 16 mins. Test the claim at 0.05 level of significance.</td><td>L3,L4</td><td>CO4</td><td>PO2</td></tr>
<tr><td></td><td>b)</td><td>Explain the steps involved in the procedure for testing of Hypothesis</td><td>L2,L4,L5</td><td>CO4</td><td>PO3</td></tr>
<tr><td>12</td><td>a)</td><td>The mean yield of wheat from a district A was 210 pounds with S.D 10 pounds per Acre from a sample of 100 plots. In another district the mean yield was 220 pounds with S. D 12 pounds from a sample of 150 plots. Assuming that the S.D of yield in the entire state was 11 pounds ,test whether there is any significant difference between the mean yield of crops.</td><td>L1,L4,L5</td><td>CO4</td><td>PO3</td></tr>
<tr><td></td><td>b)</td><td>Samples of students were drawn from two universities and from their weights in kilograms, mean and standard deviation are calculated and shown below. Make a large sample test to test the significance of the difference between the means
<table>
<tr><td></td><td>Mean</td><td>S.D</td><td>Size of the sample</td></tr>
<tr><td>University A</td><td>55</td><td>10</td><td>400</td></tr>
<tr><td>University B</td><td>57</td><td>15</td><td>100</td></tr>
</table></td><td>L3,L4</td><td>CO4</td><td>PO2</td></tr>
<tr><td>13</td><td>a)</td><td>A die was thrown 9000 times and of these 3220 yielded a 3 or 4. Is this consistent with the hypothesis that the die was unbiased?</td><td>L2,L3</td><td>CO4</td><td>PO3</td></tr>
<tr><td></td><td>b)</td><td>Random samples of 400 men and 600 women were asked</td><td>L3,L4</td><td>CO4</td><td>PO3</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| | | whether they would like to have a flyover near their residence. 200 men and 325 women were in favor of the proposal. Test the hypothesis that proportions of men and women in favor of proposal are same at 5% level. | | | |
| 14 | a) | A cigarette manufacturing firm claims that its brand A line of cigarettes outsells its brand B by 8%. If it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B, test whether the 8% difference is a valid claim. | L3,L4 | CO4 | PO3 |
| | b) | In two large populations, there are 30% and 25% respectively of fair-haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations. | L3,L4 | CO4 | PO3 |
| 15 | a) | It is claimed that a random sample of 49 tyres has a mean life of 15200kms. This sample was drawn from a population whose mean is 15150kms and a standard deviation 1200 kms. Test the significance at 0.05 level for $H_1$: $\mu \neq 15200$ | L1,L4 | CO4 | PO1 |
| | b) | Explain Type-I and Type-II errors in detail with one example each. | L1,L4 | CO4 | PO1 |
| 16 | a) | Write a short note on one-tailed and two-tailed tests. | L1,L3 | CO4 | PO2 |
| | b) | In a sample of 1000 people in Telangana 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance. | L3,L4 | CO4 | PO3 |

## UNIT–V

## APPLIED STATISTICS

| S.No | Questions | BT | CO | PO |
|---|---|---|---|---|
| **Part – A (Short Answer Questions)** | | | | |
| 1 | Define correlation and regression. | L1 | CO5 | PO1 |
| 2 | Write a short note on types of correlation. | L1 | CO5 | PO1 |
| 3 | Criticize the following: Regression coefficient of Y on X is 0.7 and that of X on Y is 3.2. | L2,L4 | CO5 | PO2 |
| 4 | If θ is the angle between two regression lines and standard deviation of Y is twice the standard deviation of X and r=0.25, find tanθ. | L2,L3 | CO5 | PO1 |
| 5 | From the following data calculate correlation coefficient and standard deviation of Y, given $b_{xy} = 0.85, b_{yx} = 0.89 \ and \ \sigma_x = 3.$ | L2,L3 | CO5 | PO1 |
| 6 | Find the regression line of X on Y and Yon X. given $\overline{X} =$ | L2,L3 | CO5 | PO1 |

<table>
<tr><td></td><td colspan="2">$83.67, \overline{Y} = 88.42, b_{xy} = 0.795, b_{yx} = 0.59$</td><td></td><td></td><td></td></tr>
<tr><td>7</td><td colspan="2">Define regression.</td><td>L1</td><td>CO5</td><td>PO1</td></tr>
<tr><td>8</td><td colspan="2">Write the Normal equations for second degree polynomial.</td><td>L1</td><td>CO5</td><td>PO1</td></tr>
<tr><td>9</td><td colspan="2">Write the properties of correlation coefficient.</td><td>L1</td><td>CO5</td><td>PO1</td></tr>
<tr><td>10</td><td colspan="2">Give a short note on Karl Pearson’s coefficient of correlation.</td><td>L1</td><td>CO5</td><td>PO1</td></tr>
<tr><td colspan="6"><b>Part – B (Long Answer Questions)</b></td></tr>
<tr><td>11</td><td>a)</td><td>Psychological tests of Intelligence and of engineering ability were applied to 10 students. Here is a record of ungrouped data showing intelligence ratio (I.R) and Engineering ratio (E.R). Calculate the coefficient of correlation.
<table>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td><td>J</td></tr>
<tr><td>I.R</td><td>105</td><td>104</td><td>102</td><td>101</td><td>100</td><td>99</td><td>98</td><td>96</td><td>93</td><td>92</td></tr>
<tr><td>E.R</td><td>101</td><td>103</td><td>100</td><td>98</td><td>95</td><td>96</td><td>104</td><td>92</td><td>97</td><td>94</td></tr>
</table></td><td>L4,L5</td><td>CO5</td><td>PO3</td></tr>
<tr><td></td><td>b)</td><td>Following are the rank obtained by 10 students in two subjects’ statistics and Mathematics. To what extent the knowledge of the students in two subjects is related.
<table>
<tr><td>statistics</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Mathematics</td><td>2</td><td>4</td><td>1</td><td>5</td><td>3</td><td>9</td><td>7</td><td>10</td><td>6</td><td>8</td></tr>
</table></td><td>L4,L5</td><td>CO5</td><td>PO4</td></tr>
<tr><td>12</td><td></td><td>Obtain the rank correlation coefficient for the following data
<table>
<tr><td>x</td><td>68</td><td>64</td><td>75</td><td>50</td><td>64</td><td>80</td><td>75</td><td>40</td><td>55</td><td>64</td></tr>
<tr><td>y</td><td>62</td><td>58</td><td>68</td><td>45</td><td>81</td><td>60</td><td>68</td><td>48</td><td>50</td><td>70</td></tr>
</table></td><td>L4,L5</td><td>CO5</td><td>PO3</td></tr>
<tr><td>13</td><td>a)</td><td>Calculate the regression equations of Y on X from the data given below, taking deviations from actual means of X and Y.
<table>
<tr><td>Price (Rs.)</td><td>10</td><td>12</td><td>13</td><td>12</td><td>16</td><td>15</td></tr>
<tr><td>Amount Demanded</td><td>40</td><td>38</td><td>43</td><td>45</td><td>37</td><td>43</td></tr>
</table>
Estimate the likely demand when the price is Rs.20.</td><td>L3,L4</td><td>CO5</td><td>PO3</td></tr>
<tr><td></td><td>b)</td><td>Calculate Karl Pearson’s correlation coefficient for the following paired data.
<table>
<tr><td>X</td><td>28</td><td>41</td><td>40</td><td>38</td><td>35</td><td>33</td><td>40</td><td>32</td><td>36</td><td>33</td></tr>
<tr><td>Y</td><td>23</td><td>34</td><td>33</td><td>34</td><td>30</td><td>26</td><td>28</td><td>31</td><td>36</td><td>38</td></tr>
</table>
What inference would you draw from the estimate.</td><td>L3</td><td>CO5</td><td>PO3</td></tr>
<tr><td>14</td><td>a)</td><td>Using the method of least square determine the constants a and b such that $y = ae^{bx}$ fits the following data.
<table>
<tr><td>x</td><td>0</td><td>0.5</td><td>1</td><td>1.5</td><td>2</td><td>2.5</td></tr>
<tr><td>y</td><td>0.10</td><td>0.45</td><td>2.15</td><td>9.15</td><td>40.35</td><td>180.75</td></tr>
</table></td><td>L2,L3</td><td>CO5</td><td>PO2</td></tr>
<tr><td></td><td>b)</td><td>From a sample of 200 pairs of observation the following quantities were calculated.
$$\sum X = 11.34, \sum Y = 20.78,$$</td><td>L2,L3</td><td>CO5</td><td>PO2</td></tr>
</table>

<table>
<tr><td></td><td></td><td>$$\sum X^2 = 12.16, \sum Y^2 = 84.96, \sum XY = 22.13$$ From the above data, show how to compute the coefficients of the equation Y=a+bX</td><td></td><td></td><td></td></tr>
<tr><td>15</td><td></td><td>Calculate coefficient of correlation between the marks obtained by a batch of 100 students in Accountancy and statistics are given below.
<table>
<tr><td rowspan="2">Marks in Statistics</td><td colspan="6">Marks in Accountancy</td></tr>
<tr><td>20-30</td><td>30-40</td><td>40-50</td><td>50-60</td><td>60-70</td><td>Total</td></tr>
<tr><td>15-25</td><td>5</td><td>9</td><td>3</td><td>-</td><td>-</td><td>17</td></tr>
<tr><td>25-35</td><td></td><td>10</td><td>25</td><td>2</td><td>-</td><td>37</td></tr>
<tr><td>35-45</td><td></td><td>1</td><td>12</td><td>2</td><td></td><td>15</td></tr>
<tr><td>45-55</td><td></td><td></td><td>4</td><td>16</td><td>5</td><td>25</td></tr>
<tr><td>55-65</td><td></td><td></td><td></td><td>4</td><td>2</td><td>6</td></tr>
<tr><td>Total</td><td>5</td><td>20</td><td>44</td><td>24</td><td>7</td><td>100</td></tr>
</table></td><td>L4,L5</td><td>CO5</td><td>PO3</td></tr>
<tr><td>16</td><td></td><td>Fit a second-degree polynomial to the following data by the method of least squares
<table>
<tr><td>x</td><td>10</td><td>12</td><td>15</td><td>23</td><td>10</td></tr>
<tr><td>y</td><td>14</td><td>17</td><td>23</td><td>25</td><td>21</td></tr>
</table></td><td>L4,L5</td><td>CO5</td><td>PO3</td></tr>
</table>

* **Blooms Taxonomy Level (BT)** (L1 – Remembering; L2 – Understanding; L3 – Applying; L4 – Analyzing;

L5 – Evaluating; L6 – Creating)
**Course Outcomes (CO)Program Outcomes (PO)**

**Prepared By:** **HOD**

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ASSISTANT PROFESSOR

MATHEMATICS, FME