SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM NAGAR, KATTANKULATHUR-603203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

IV SEMESTER

1918405 – STATISTICS AND NUMERICAL METHODS

REGULATION – 2019

ACADEMIC YEAR 2022 – 2023

Prepared by

Mr. N. Sundarakannan, Assistant Professor/Mathematics

SRM VALLIAMMAI ENGINEERING COLLEGE

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DEPARTMENT OF MATHEMATICS

SUBJECT : 1918405 – STATISTICS AND NUMERICAL METHODS
SEM/YEAR : IV/II

UNIT I :TESTING OF HYPOTHESIS **9L+3T**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

PART – A

Q.No.	Question	BT Level	Competence
1.	Define Statistics	BTL -1	Remembering
2.	Define Parameter.	BTL -1	Remembering
3.	Explain null and alternate hypothesis.	BTL -1	Remembering
4.	Mention the various steps involved in testing of hypothesis.	BTL -1	Remembering
5.	What is the essential difference between confidence limits and tolerance limits?	BTL -1	Remembering
6.	Define Standard Error.	BTL -1	Remembering
7.	Define Type I and Type II error.	BTL -2	Understanding
8.	What are the parameters and statistics in sampling.	BTL -2	Understanding
9.	Define level of significance.	BTL -2	Understanding
10.	What is the test statistic for single proportion test?	BTL -2	Understanding
11.	A random sa mple of 25 cups from a certain coffee dispensing machine yields a mean x = 6.9 occurs per cup. Use 0.05 level of significance to test, on the average, the machine dispense $\mu = 7.0$ ounces against the null hypothesis that, on the average, the machine dispenses $\mu < 7.0$ ounces. Assume that the distribution of ounces per cup is normal, and that the variance is the known quantity σ^2=0.01 ounces	BTL -3	Applying
12.	Twenty people were attacked by a disease and only 18 were survived. The hypothesis is set in such a way that the survival rate is 85% if attacked by this disease. Will you reject the hypothesis that it is more at 5% level.($Z_{0.05} = 1.645$).	BTL -3	Applying
13.	In a large city A, 20 percent of a random sample of 900 school boys had a slight physical defect. In another large city B, 18.5 percent of a random sample of 1600 school boys had some defect. Is the difference between the proportions significant?	BTL -6	Creating
14.	A standard sample of 200 tins of coconut oil gave an average weight of 4.95 kg with a standard deviation of 0.21 kg. Do we accept that the net weight is 5 kg per tin at 5% level of significance?	BTL -4	Analyzing
15.	Write down the formula of test statistic ‘t’ to test the significance of difference between the population mean and sample mean.	BTL -4	Analyzing
16.	Write down the formula of test statistic ‘t’ to test the significance of difference between two sample means.	BTL -3	Applying
17.	What are the applications of t-test?	BTL -5	Evaluating

<table>
<tr><td>18.</td><td>What is the assumption of t-test?</td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>19.</td><td>Write the application of ‘F’ test.</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>20.</td><td>Define ‘F’ variate.</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>21.</td><td>What are the properties of “F” test?</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>22.</td><td>Write the formula for the chi- square test of goodness of fit of a random sample to a hypothetical distribution.</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>23.</td><td>State the main use of ψ^2-test</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>24.</td><td>What are the expected frequencies of 2x2 contingency table?
<table><tr><td>a</td><td>b</td></tr><tr><td>c</td><td>d</td></tr></table></td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>25.</td><td>State any two applications of ψ^2-test.</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td colspan="4">PART – B</td></tr>
<tr><td>1.(a)</td><td>A sample of 100 students is taken from a large population. The mean height of the students in this sample is 160cms. Can it be reasonably regarded that this sample is from a population of mean 165 cm and standard deviation 10 cm?</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>1.(b)</td><td>Test of fidelity and selectivity of 190 radio receivers produced the results shown in the following table
Fidelity
<table><tr><td>Selectivity</td><td>Low</td><td>Average</td><td>High</td></tr><tr><td>Low</td><td>6</td><td>12</td><td>32</td></tr><tr><td>Average</td><td>33</td><td>61</td><td>18</td></tr><tr><td>High</td><td>13</td><td>15</td><td>0</td></tr></table>Use 0.01 level of significance to test whether there is a relationship between fidelity and selectivity.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>2.</td><td>Given the following table for hair color and eye color, identify the value of Chi-square. Is there good association between hair color and eye color?
<table><tr><td colspan="6">Hair color</td></tr><tr><td rowspan="5">Eye color</td><td></td><td>Fair</td><td>Brown</td><td>Black</td><td>Total</td></tr><tr><td>Blue</td><td>15</td><td>5</td><td>20</td><td>40</td></tr><tr><td>Grey</td><td>20</td><td>10</td><td>20</td><td>50</td></tr><tr><td>Brown</td><td>25</td><td>15</td><td>20</td><td>60</td></tr><tr><td>Total</td><td>60</td><td>30</td><td>60</td><td>150</td></tr></table></td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>3.</td><td>Two independent samples of sizes 8 and 7 contained the following values.
<table><tr><td>Sample I</td><td>19</td><td>17</td><td>15</td><td>21</td><td>16</td><td>18</td><td>16</td><td>14</td></tr><tr><td>Sample II</td><td>15</td><td>14</td><td>15</td><td>19</td><td>15</td><td>18</td><td>16</td><td></td></tr></table>Test if the two populations have the same mean.</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>4.</td><td>Two independent samples of 8 and 7 items respectively had the following
<table><tr><td>Sample I</td><td>9</td><td>11</td><td>13</td><td>11</td><td>15</td><td>9</td><td>12</td><td>14</td></tr><tr><td>Sample II</td><td>10</td><td>12</td><td>10</td><td>14</td><td>9</td><td>8</td><td>10</td><td></td></tr></table>Values of the variable (weight in kgs.) Use 0.05 LOS to test whether the variances of the two population’s sample are equal.</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>5. (a)</td><td>A group of 10 rats fed on diet A and another group of 8 rats fed on diet B, Recorded the following increase the following increase in weight.(gm)
<table><tr><td>Diet A</td><td>5</td><td>6</td><td>8</td><td>1</td><td>12</td><td>4</td><td>3</td><td>9</td><td>6</td><td>10</td></tr><tr><td>Diet B</td><td>2</td><td>3</td><td>6</td><td>8</td><td>10</td><td>1</td><td>2</td><td>8</td><td>-</td><td>-</td></tr></table>Find the variances are significantly different. (Use F-test)</td><td>BTL -5</td><td>Evaluating</td></tr>
</table>

<table>
<tr><td>5.(b)</td><td>The marks obtained by a group of 9 regular course students and another group of 11 part time course students in a test are given below :
<table>
<tr><td>Sample I</td><td>56</td><td>62</td><td>63</td><td>54</td><td>60</td><td>51</td><td>67</td><td>69</td><td>58</td><td></td><td></td></tr>
<tr><td>Sample II</td><td>62</td><td>70</td><td>71</td><td>62</td><td>60</td><td>56</td><td>75</td><td>64</td><td>72</td><td>68</td><td>66</td></tr>
</table>
Examine whether the marks obtained by regular students and part-time students differ significantly at 5% levels of significance.</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>6.</td><td>In a certain factory there are two independent processes manufacturing the same item. The average weight in a sample of 250 items produced from one process is found to be 120 Ozs, with a standard deviation of 12 Ozs, while the corresponding figures in a sample of 400 items from the other process are 124 and 14. Is the difference between the two sample means significant?</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>7.</td><td>Records taken of the number of male and female births in 800 families having four Children are as follows :
Number of male births : 0 1 2 3 4
Number of female births : 4 3 2 1 0
Number of Families : 32 178 290 236 64
Infer whether the data are consistent with the hypothesis that the binomial law holds the chance of a male birth is equal to female birth, namely $p = \frac{1}{2} = q$.</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>8.</td><td>A survey of 320 families with 5 children each revealed the following distribution
<table>
<tr><td>Boys</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>Girls</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>Families</td><td>14</td><td>56</td><td>110</td><td>88</td><td>40</td><td>12</td></tr>
</table>
Is this result consistent with the hypothesis that male and female births are equally probable?</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>9.</td><td>The nicotine content in milligram of two samples of toboco where found to be as follows
Sample 1 24 27 26 21 25
Sample 2 27 30 28 31 22 36
Can it be said that this samples where from normal population with the same mean.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>10.</td><td>Two random samples gave the following results:
<table>
<tr><td>Sample</td><td>Size</td><td>Sample mean</td><td>Sum of squares of deviation from the mean</td></tr>
<tr><td>1</td><td>10</td><td>15</td><td>90</td></tr>
<tr><td>2</td><td>12</td><td>14</td><td>108</td></tr>
</table>
Analyze whether the samples have come from the same normal population.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>11.</td><td>Mechanical engineers testing a new arc welding technique, classified welds both with respect to appearance and an X-ray inspection
<table>
<tr><td>X-ray/Appearance</td><td>Bad</td><td>Normal</td><td>Good</td></tr>
<tr><td>Bad</td><td>20</td><td>7</td><td>3</td></tr>
<tr><td>Normal</td><td>13</td><td>51</td><td>16</td></tr>
<tr><td>Good</td><td>7</td><td>12</td><td>21</td></tr>
</table>
Test for independence using 0.05 level of significance.</td><td>BTL -3</td><td>Applying</td></tr>
</table>

<table>
<tr><td>12.</td><td>A sample of 200 persons with a particular disease was selected. Out of these, 100 were given a drug and the others were not given any drug. The result are as follows:
<table>
<tr><td>Number of persons</td><td>Drug</td><td>No drug</td><td>Total</td></tr>
<tr><td>Cured</td><td>65</td><td>55</td><td>120</td></tr>
<tr><td>Not cured</td><td>35</td><td>45</td><td>80</td></tr>
<tr><td>Total</td><td>100</td><td>100</td><td>200</td></tr>
</table>
Test whether the drug is effective or not?</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>13.</td><td>The following data gives the number of aircraft accidents that occurred during the various days of a week. Find whether the accidents are uniformly distributed over the week
<table>
<tr><td>Days</td><td>Sun</td><td>Mon</td><td>Tues</td><td>Wed</td><td>Thu</td><td>Fri</td><td>Sat</td></tr>
<tr><td>No. of accidents</td><td>14</td><td>16</td><td>08</td><td>12</td><td>11</td><td>9</td><td>14</td></tr>
</table></td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>14.</td><td>The nicotine content in milligram of two samples of tobacco where found to be as follows, test the significant difference between means of the two samples.
<table>
<tr><td>Sample I</td><td>21</td><td>24</td><td>25</td><td>26</td><td>27</td><td>-</td></tr>
<tr><td>Sample II</td><td>22</td><td>27</td><td>28</td><td>30</td><td>31</td><td>36</td></tr>
</table></td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>15.(a)</td><td>The mean braking strength of the cables supplied by manufacture is 1800 with S.D 100. By a new technique in the manufacturing process it is claimed that the breaking strength of the cable has increased. To test this claim a sample of 50 cables is tested and is found that the mean braking strength is 1850. Can we support the claim at 1% level of significance.</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>15.(b)</td><td>In a sample of 8 observations, the sum of squares of devaitation of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5% level, given that the 5% point of F for v1=7 and v2=9 defres of freedom is 3,27</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>16.(a)</td><td>A simple sample of heights of 6400 Englishmen has a mean of 170cms and a standard deviation of 6.4cms, while a simple sample of heights of 1600 Americans has a mean of 172 cm and a standard deviation of 6.3cms. Do the data indicate that Americans are, on the average, taller than Englishmen?</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>16.(b)</td><td>The theory predicts that the population of beans in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the number in the four groups was 882,313,287 and 118. Do the experimental results support the survey?</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>17.(a)</td><td>The mean population of a random sample of 4000 villages in Jaipur district was found to be 400 with a standard deviation of 12. The mean population of a random sample of 400 villages in Meerut district was found to be 395 with standard deviation of 15. Is the difference between the two district's means statistically significant?</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>17.(b)</td><td>Discuss the chi square of independence of attributes.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>18.</td><td>The heights of 10 males of a given locality are found to be 70, 67, 62, 68, 61, 68, 70, 64, 64, 66 inches. Is it reasonable to believe that the average height is grater than 64 inches?</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td colspan="4">PART-C</td></tr>
<tr><td>1.</td><td>Twp samples of 6 and 7 items have the following values for a variable.</td><td>BTL -2</td><td>Understanding</td></tr>
</table>

<table>
<tr><td></td><td>Sample 1: 39, 41, 42, 42, 44, 40
Sample 2 : 40, 42, 39, 45, 38, 39, 40
Do the sample variances differ significantly?</td><td></td><td></td></tr>
<tr><td>2.</td><td>Two random samples gave the following data.
<table>
<tr><td>Sample</td><td>Size</td><td>Mean</td><td>Variance</td></tr>
<tr><td>1</td><td>8</td><td>9.6</td><td>1.2</td></tr>
<tr><td>2</td><td>11</td><td>16.5</td><td>2.5</td></tr>
</table>
Can we conclude that the two samples have drawn from the same normal population?</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>3.</td><td>Random samples drawn from two places gave the following data relating to the heights of male adults:
<table>
<tr><td></td><td>Place A</td><td>Place B</td></tr>
<tr><td>Mean height (in inches)</td><td>68.50</td><td>65.50</td></tr>
<tr><td>S.D (in inches)</td><td>2.5</td><td>3.0</td></tr>
<tr><td>No. of adut males in sample</td><td>1200</td><td>1500</td></tr>
</table>
Test at 5 % level, that the mean height is the same for adults in the two places.</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>4.</td><td>Samples of two types of electric bulbs were tested for length of life and following data were obtained.
<table>
<tr><td></td><td>Type I</td><td>Type II</td></tr>
<tr><td>Sample Size</td><td>8</td><td>7</td></tr>
<tr><td>Sample Mean</td><td>1234hrs</td><td>1036hrs</td></tr>
<tr><td>Sample S.D</td><td>36hrs</td><td>40hrs</td></tr>
</table>
Analyze that, is the difference in the means sufficient to warrant that type I is superior to type II regarding the length of life?</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>5.</td><td>5 coins were tossed 320 times. The number of heads observed is given below :
<table>
<tr><td>No. of heads</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>Observed frequencies</td><td>15</td><td>45</td><td>85</td><td>95</td><td>60</td><td>20</td></tr>
</table>
Examine whether the coin is unbiased .Use 5% level of significance.</td><td>BTL -4</td><td>Analyzing</td></tr>
</table>

UNIT II-DESIGN OF EXPERIMENTS **9L+3T**

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design.

PART – A

Q.No.	Question	BT Level	Competence
1.	What is ANOVA?	BTL -1	Remembering
2.	What are the uses of ANOVA?	BTL -1	Remembering
3.	What are the components of design of experiment?	BTL -1	Remembering
4.	Write the basic assumptions in analysis of variance.	BTL -1	Remembering
5.	What are the basic principles of Experimental Design?	BTL -1	Remembering
6.	Define experimental error.	BTL -1	Remembering
7.	Write any two advantages of RBD over CRD.	BTL -2	Understanding
8.	What is the aim of design of experiments?	BTL -2	Understanding
9.	What is the degrees of freedom for Error in one way classficiation?	BTL -2	Understanding
10.	What is the degrees of freedom for Error in Two way classficiation?	BTL -2	Understanding
11.	What is the degrees of freedom for Sum of Squares due to Treatments in One–way Classification?	BTL -3	Applying
12.	What is the TSS degrees of freedom for Two–way Classification with r – rows and c – columns?	BTL -3	Applying
13.	What is meant by tolerance limits?	BTL -3	Applying
14.	What are the basic elements of an Completely Randomized Experimental Design?	BTL -4	Analyzing
15.	When do you apply analysis of variance technique?	BTL -4	Analyzing
16.	Define Replication	BTL -4	Analyzing
17.	What is a completely randomized design.	BTL -5	Evaluating
18.	Explain the advantages of a Latin square design?	BTL -5	Evaluating
19.	Demonstrate the purpose of blocking in a randomized block design?	BTL -6	Creating
20.	State the Basic principles of the design of experiment?	BTL -4	Analyzing
21.	Why a 2x2 Latin square is not possible? Explain.	BTL -3	Applying
22.	Demonstrate main advantage of Latin square Design over Randomized Block Design?	BTL -3	Applying
23.	Analyze the advantages of the Latin square design over the other design.	BTL -3	Applying
24.	Write any two differences between RBD and LSD.	BTL -4	Analyzing
25.	Define Randomization	BTL -4	Analyzing

PART – B

1.	The accompanying data resulted from an experiment comparing the degree of soiling for fabric copolymerized with the 3 different mixtures of met acrylic acid. Analyze the classification. Mixture 1 : 0.56 1.12 0.90 1.07 0.94 Mixture 2 : 0.72 0.69 0.87 0.78 0.91 Mixture 3 : 0.62 1.08 1.07 0.99 0.93	BTL -1	Remembering
2.	The following table shows the lives in hours of four brands of electric lamps brand A: 1610, 1610, 1650, 1680, 1700, 1720, 1800 B: 1580, 1640, 1640, 1700, 1750 C: 1460, 1550, 1600, 1620, 1640, 1660, 1740, 1820 D: 1510, 1520, 1530, 1570, 1600, 1680 Identify an analysis of variance and test the homogeneity of the mean lives of the four brands of lamps.	BTL -1	Remembering

<table>
<tr>
<td>3.</td>
<td>In order to determine whether the significant difference in the durability of 3makes of computers, samples of size 5 are selected from each make and the frequency of repair during the first year of purchase is observed. The results are as follows: In view of the above data, what conclusion can you draw?
Makes
<table>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>5</td><td>8</td><td>7</td></tr>
<tr><td>6</td><td>10</td><td>3</td></tr>
<tr><td>8</td><td>11</td><td>5</td></tr>
<tr><td>9</td><td>12</td><td>4</td></tr>
<tr><td>7</td><td>4</td><td>1</td></tr>
</table>
</td>
<td>BTL -1</td>
<td>Remembering</td>
</tr>
<tr>
<td>4.</td>
<td>A random sample is selected from each of 3 makes of ropes and their braking strength are measured with the following results.
I : 70 72 75 80 83
II : 100 110 108 112 113 120 107
III : 60 65 57 84 87 73
Test whether the braking strehgth of the ropes differs significantly?</td>
<td>BTL -2</td>
<td>Understanding</td>
</tr>
<tr>
<td>5.</td>
<td>The following are the number of mistakes made in 5 successive days by four technicians working for a photographic laboratory. Test whether the difference among the four sample means can be attributed to chance. Test at a level of significance α = 0.01.
<table>
<tr><th colspan="4">Technician</th></tr>
<tr><td>I</td><td>II</td><td>III</td><td>IV</td></tr>
<tr><td>6</td><td>14</td><td>10</td><td>9</td></tr>
<tr><td>14</td><td>9</td><td>12</td><td>12</td></tr>
<tr><td>10</td><td>12</td><td>7</td><td>8</td></tr>
<tr><td>8</td><td>10</td><td>15</td><td>10</td></tr>
<tr><td>11</td><td>14</td><td>11</td><td>11</td></tr>
</table>
</td>
<td>BTL -3</td>
<td>Applying</td>
</tr>
<tr>
<td>6.</td>
<td>A random sample is selected from each of three makes of ropes and their breaking strength (in pounds) are measured with the following results
Sample I : 70 72 75 80 83
Sample II : 100 110 108 112 113 120 107
Sample III: 60 65 57 84 87 73
Test whether the breaking strength of the ropes differs significantly?</td>
<td>BTL -2</td>
<td>Understanding</td>
</tr>
<tr>
<td>7.</td>
<td>Ten persons were appointed in the officer cadre in an office. Their performance was noted by giving a test and marks were recorded out of 100.
Employee : A B C D E F G H I J
Before Training : 80 76 92 60 70 56 74 56 70 56
After Training : 84 70 96 80 70 52 84 72 72 50
By applying t-test can it be concluded that the employees have been benefited by the training?</td>
<td>BTL -4</td>
<td>Analyzing</td>
</tr>
</table>

<table>
<tr>
<td>8.</td>
<td>Five doctors each test five treatments for a certain disease and observe the number of days each patient takes to recover. The results are as follows (recovery time in days)
<table>
<tr><td></td><td colspan="5">Treatment</td></tr>
<tr><td>Doctor</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>A</td><td>10</td><td>14</td><td>23</td><td>18</td><td>20</td></tr>
<tr><td>B</td><td>11</td><td>15</td><td>24</td><td>17</td><td>21</td></tr>
<tr><td>C</td><td>9</td><td>12</td><td>20</td><td>16</td><td>19</td></tr>
<tr><td>D</td><td>8</td><td>13</td><td>17</td><td>17</td><td>20</td></tr>
<tr><td>E</td><td>12</td><td>15</td><td>19</td><td>15</td><td>22</td></tr>
</table>
Estimate the difference between (a) doctors and (b) treatments for the above data at 5% level.</td>
<td>BTL -1</td>
<td>Remembering</td>
</tr>
<tr>
<td>9.</td>
<td>Perform a 2-way ANOVA on the data given below:
<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="3">Treatment 1</td></tr>
<tr><td>1</td><td>2</td><td>3</td></tr>
<tr><td rowspan="5">Treatment 2</td><td>1</td><td>30</td><td>26</td><td>38</td></tr>
<tr><td>2</td><td>24</td><td>29</td><td>28</td></tr>
<tr><td>3</td><td>33</td><td>24</td><td>35</td></tr>
<tr><td>4</td><td>36</td><td>31</td><td>30</td></tr>
<tr><td>5</td><td>27</td><td>35</td><td>33</td></tr>
</table>
Use the coding method subtracting 30 from the given no.</td>
<td>BTL -1</td>
<td>Remembering</td>
</tr>
<tr>
<td>10.</td>
<td>A chemist wishes to test the effect of four chemical agents on the strength of a particular type of cloth. Because there might be variability from one bolt to another , the chemist decides to use a randomized block design ,with the bolts of cloth consider as blocks ,she selects five bolts and applies all four chemical in random order to each bolt, The resulting tensile strength follows
<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="5">BOLT</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td rowspan="4">CHEMICAL</td><td>1</td><td>73</td><td>68</td><td>74</td><td>71</td><td>67</td></tr>
<tr><td>2</td><td>73</td><td>67</td><td>75</td><td>72</td><td>70</td></tr>
<tr><td>3</td><td>75</td><td>68</td><td>78</td><td>73</td><td>68</td></tr>
<tr><td>4</td><td>73</td><td>71</td><td>75</td><td>75</td><td>69</td></tr>
</table>
Does the tensile strength depend on chemical? Test at 10% level of significance.</td>
<td>BTL -4</td>
<td>Analyzing</td>
</tr>
<tr>
<td>11.</td>
<td>The following data represents the number of units of production per day turned out by different workers using 4 different types of machines
<table>
<tr><td></td><td></td><td colspan="4">Machine Type</td></tr>
<tr><td rowspan="6">Workers</td><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>1</td><td>44</td><td>38</td><td>47</td><td>36</td></tr>
<tr><td>2</td><td>46</td><td>40</td><td>52</td><td>43</td></tr>
<tr><td>3</td><td>34</td><td>36</td><td>44</td><td>32</td></tr>
<tr><td>4</td><td>43</td><td>38</td><td>46</td><td>33</td></tr>
<tr><td>5</td><td>38</td><td>42</td><td>49</td><td>39</td></tr>
</table>
Test whether the mean productivity is the same for the 4 different machines types and 5 different workers?</td>
<td>BTL -6</td>
<td>Creating</td>
</tr>
</table>

<table>
<tr>
<td>12.</td>
<td>Four different though supposedly equivalent forms of a standardized reading achievement test were given to each of 5 students and the following are the scores, which they obtained
<table>
<tr><td colspan="2"></td><td colspan="5">Student</td></tr>
<tr><td colspan="2"></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td rowspan="4">Form</td><td>A</td><td>75</td><td>73</td><td>59</td><td>69</td><td>84</td></tr>
<tr><td>B</td><td>83</td><td>72</td><td>56</td><td>70</td><td>92</td></tr>
<tr><td>C</td><td>86</td><td>61</td><td>53</td><td>72</td><td>88</td></tr>
<tr><td>D</td><td>73</td><td>67</td><td>62</td><td>79</td><td>95</td></tr>
</table>
Perform a two way analysis of variance to test at the level of significance 1%.</td>
<td>BTL -3</td>
<td>Applying</td>
</tr>
<tr>
<td>13.</td>
<td>A latin square design was used to compare the bond strength of gold semiconductor lead wires bounded to the lead terminal by five different methods A, B, C, D & E. The bonds were made by five different operators and the device were encapsulated using five different plastics. With the following result ,expressed as pounds of force required to break the bond
<table>
<tr><td>Plastics/ operator</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>1</td><td>A3</td><td>B2.4</td><td>C1.9</td><td>D2.2</td><td>E1.7</td></tr>
<tr><td>2</td><td>B2.1</td><td>C2.7</td><td>D2.3</td><td>E2.5</td><td>A3.1</td></tr>
<tr><td>3</td><td>C2.1</td><td>D2.6</td><td>E2.5</td><td>A2.9</td><td>B2.1</td></tr>
<tr><td>4</td><td>D2.0</td><td>E2.5</td><td>B3.2</td><td>B2.5</td><td>C2.2</td></tr>
<tr><td>5</td><td>E2.1</td><td>A3.6</td><td>B2.4</td><td>C2.4</td><td>D2.1</td></tr>
</table>
Analyze these results and test with .01 level of significance.</td>
<td>BTL -4</td>
<td>Analyzing</td>
</tr>
<tr>
<td>14.</td>
<td>The following data resulted from an experiment to compare three burners A, B, C. A Latin square design was used as the tests were made on 3 engines and were spread over 3 days.
<table>
<tr><td>A 16</td><td>B 17</td><td>C 20</td></tr>
<tr><td>B 16</td><td>C 21</td><td>A 15</td></tr>
<tr><td>C 15</td><td>A 12</td><td>B 13</td></tr>
</table>
Test the hypothesis and infer that there is no difference between the burners.</td>
<td>BTL -4</td>
<td>Analyzing</td>
</tr>
<tr>
<td>15.</td>
<td>A farmer wishes to test the effects of four different fertilizers A,B,C, Don the yield of Wheat. In order to eliminate sources of error due to variability in soil fertility, he uses the fertilizers, in a Latin square arrangement a syndicated in the following table, where the numbers indicate yields per unit area.
<table>
<tr><td>A18</td><td>C21</td><td>D25</td><td>B11</td></tr>
<tr><td>D22</td><td>B12</td><td>A15</td><td>C19</td></tr>
<tr><td>B15</td><td>A20</td><td>C23</td><td>D24</td></tr>
<tr><td>C22</td><td>D21</td><td>B10</td><td>A17</td></tr>
</table>
Design an analysis of variance to determine if there is a significant difference between the fertilizers at α=0.05 and α=0.01 levels of significance.</td>
<td>BTL -4</td>
<td>Analyzing</td>
</tr>
<tr>
<td>16.</td>
<td>Set up the analysis of variance for the following results of a Latin Square Design(use α = 0.01) level of significance
<table>
<tr><td>A12</td><td>C19</td><td>B10</td><td>D8</td></tr>
<tr><td>C18</td><td>B12</td><td>D6</td><td>A7</td></tr>
<tr><td>B22</td><td>D10</td><td>A5</td><td>C21</td></tr>
<tr><td>D12</td><td>A7</td><td>C27</td><td>B17</td></tr>
</table></td>
<td>BTL -3</td>
<td>Applying</td>
</tr>
</table>

<table>
<tr><td>17.</td><td>In a 5x5 Latin square experiment, the data collected is given in the matrix below Yield per plot is given in quintals for the five different cultivation treatments A, B, C,D and E. Perform the analysis of variance.
A48 E66 D56 C52 B61
D64 B62 A50 E64 C63
B69 A53 C60 D61 E67
C57 D58 E67 B65 A55
E67 C57 B66 A60 D57</td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>18.</td><td>In a Latin square experiment given below are the yields in quintals per acre on the paddy crop carried out for testing the effect of five fertilizers A, B, C, D, E. Analyze the data for variations.
B25 A18 E27 D30 C27
A19 D31 C29 E26 B23
C28 B22 D33 A18 E27
E28 C26 A20 B25 D33
D32 E25 B23 C28 A20</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td colspan="4">PART-C</td></tr>
<tr><td>1.</td><td>A set of data involving 4 tropical food stuffs A, B, C, D tried on 20 chicks is given below. All the 20 chicks are treated alike in all respects except the feeding treatments and each feeding treatment is given to 5 chicks. Analyze the data:
A 55 49 42 21 52
B 61 112 30 89 63
C 42 97 81 95 92
D 169 137 169 85 154</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>2.</td><td>In a test given to two groups of students the marks obtained were as follows,
First group : 18 20 36 50 49 36 34 49 41
Second group: 29 28 26 35 30 41 46
Examine the significance difference between the means of marks secured by students of the above two groups.</td><td></td><td></td></tr>
<tr><td>3.</td><td>A company appoints 4 salesmen A, B, C and D and observes their sales in 3 seasons, summer winter and monsoon. The figures are given in the following table:
<table>
<tr><td></td><td colspan="4">Salesmen</td></tr>
<tr><td>Season</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Summer</td><td>45</td><td>40</td><td>28</td><td>37</td></tr>
<tr><td>Winter</td><td>43</td><td>41</td><td>45</td><td>38</td></tr>
<tr><td>Monsoon</td><td>39</td><td>39</td><td>43</td><td>41</td></tr>
</table>
Carry out an Analysis of variances.</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>4.</td><td>A variable trial was conducted on wheat with 4 varieties in a Latin square design. The plan of the experiment and the per plot yield are given below.
C25 B23 A20 D20
A19 D19 C21 B18
B19 A14 D17 C20
D17 C20 B21 A15</td><td>BTL -5</td><td>Evaluating</td></tr>
</table>

5.	A laboratory technician measures the breaking strength of each of five kinds of linen threads by using four different measuring instruments, and obtain the following results.	BTL-1	Understanding

		Instruments			
		I1	I2	I3	I4
Thread	1	20.9	20.4	19.9	21.9
	2	25	26.2	27.0	24.8
	3	25.5	23.1	21.5	24.4
	4	24.8	21.2	23.5	25.7
	5	19.6	21.2	22.1	22.1

Perform a 2-way ANOVA using the 0.05 level of significance.

UNIT-III: SOLUTION OF EQUATIONS ANDEIGENVALUEPROBLEMS 9L+3T

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative method of Gauss Seidel –Dominant Eigen value of a matrix by Power method.

PART – A

Q.No.	Question	BT Level	Competence
1.	Give two examples of transcendental and algebraic equations	BTL -1	Remembering
2.	When should we not use Newton Raphson method?	BTL -1	Remembering
3.	Write the iterative formula of Newton's- Raphson Method	BTL -1	Remembering
4.	State the rate of Convergence and the criteria for the convergence of Newton Raphson method.	BTL -2	Understanding
5.	Derive the Newton's iterative formula for P^{th} root of a number N.	BTL -3	Applying
6.	Find where the real root lies in between, for the equation $x \tan x = -1$.	BTL -3	Applying
7.	State the order and condition for Convergence of Iteration method.	BTL -2	Understanding
8	State the principle used in Gauss Jordon method.	BTL -2	Understanding
9.	Find the inverse of $A = \begin{pmatrix} 4 & 1 \\ 1 & 3 \end{pmatrix}$ by Jordon method.	BTL -3	Applying
10	Solve by Gauss Elimination method $x + y = 2$ and $2x + 3y = 5$	BTL -2	Understanding
11.	Distinguish the advantages of iterative methods over direct method of solving a system of linear algebraic equations.	BTL -4	Analyzing
12.	Find the inverse of $A = \begin{pmatrix} 1 & 3 \\ 2 & 7 \end{pmatrix}$ by Jordan method.	BTL -3	Applying
13.	Compare Gauss Elimination, Gauss Jordan method.	BTL -4	Analyzing
14.	State the condition for the convergence of Gauss Seidel iteration method for solving a system of linear equation.	BTL -2	Understanding
15.	Compare Gauss seidel method, Gauss Jacobi method.	BTL -4	Analyzing
16.	Which of the iterative methods is used for solving linear system of equations it converges fast? Why?	BTL -1	Remembering
17.	Compare Gauss seidel method, Gauss Elimination method.	BTL -4	Analyzing
18.	Explain Power method to find the dominant Eigen value of a square matrix A	BTL -2	Understanding
19.	How will you find the smallest Eigen value of a matrix A.	BTL -4	Analyzing
20.	Find the dominant Eigen value of $A = \begin{pmatrix} 2 & 3 \\ 5 & 4 \end{pmatrix}$ by power method up to 1 decimal place accuracy. Start with $X^{(0)} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$	BTL -3	Applying
21.	Write the other name of Newton Raphson method?	BTL -1	Remembering

22.	When Gauss Elimination method fails?	BTL -1	Remembering
23.	Give two indirect methods to solve system of linear equations.	BTL -1	Remembering
24.	Is the Iteration method, a self-correcting method always?	BTL -4	Analyzing
25.	Find the root of the equation $x^3 - 2x - 5 = 0$.	BTL -3	Applying
	PART – B		
1.	Find the positive real root of log_{10} x = 1.2 using Newton – Raphson method.	BTL -3	Applying
2.(a)	Evaluate the inverse of the matrix $\begin{pmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}$ using Gauss Jordan method.	BTL -5	Evaluating
2.(b)	Evaluate the positive real root of $x^2 - 2x - 3 = 0$ using Iteration method, Correct to 3 decimal places.	BTL -5	Evaluating
3.(a)	Find the inverse of the matrix $\begin{pmatrix} 2 & 2 & 3 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{pmatrix}$ using Gauss Jordan method.	BTL -3	Applying
3.(b)	Solve by Gauss Elimination method 3x + y - z = 3 ; 2x – 8y + z = -5 ; x -2y + 9z = 8	BTL -3	Applying
4.	Find the dominant Eigen value and vector of $A = \begin{pmatrix} 3 & 2 & 4 \\ -1 & 4 & 10 \\ 1 & 3 & -1 \end{pmatrix}$ using Power method.	BTL -3	Applying
5. (a)	Solve by Gauss Jordan method 10 x + y + z =12 ; 2x + 10y + z = 13; x + y + 5z =7.	BTL -3	Applying
5.(b)	Find the positive root of $\cos x = 3x - 1$ correct to 3 decimal places using fixed point iteration method.	BTL -3	Applying
6.	Apply Gauss Seidel method to solve system of equations x – 2y +5z = 12 ; 5x + 2y - z = 6 ; 2x + 6 y – 3z = 5 (Do up to 5 iterations)	BTL -3	Applying
7.	Using Newton's method find the iterative formula for $\frac{1}{N}$ where N is positive integer and hence find the value of $\frac{1}{26}$	BTL -1	Remembering
8.	By Gauss seidel method to solve system of equations x + y + 54z = 110; 27x + 6y –z = 85; 6x + 15y – 2z =72.	BTL -4	Analyzing
9.	Find the real root of Cos x = x e^x using Newton - Raphson method by using initial approximation $x_0 = 0.5$.	BTL -3	Applying
10.	Evaluate the dominant Eigen value and vector of $A = \begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ using Power method.	BTL -5	Evaluating
11.	Determine the largest eigenvalue and the corresponding eigenvectors of the matrix $\begin{pmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{pmatrix}$	BTL -6	Creating
12.	Using Gauss-Jordan method, find the inverse of the matrix $\begin{pmatrix} 8 & -4 & 0 \\ -4 & 8 & -4 \\ 0 & -4 & 8 \end{pmatrix}$	BTL -3	Applying
13.	Find the positive root of $e^x - 3x = 0$ correct to 3 decimal places using fixed point iteration method.	BTL -3	Applying

14.	Solve using Gauss-Seidal method $8x - 3y + 2z = 20,\ 4x + 11y - z = 33,\ 6x + 3y + 12z = 35$.	BTL -3	Applying
15.	Solve by Gauss Elimination method x +3y +3z = 16 ; x +4y +3z = 18 ; x +3y +4z =19.	BTL -3	Applying
16.	Solve by Gauss Jordan method 10 x -2y + 3z =23 ; 2x + 10y -5z = -33; 3x -4y + 10z =41.	BTL -3	Applying
17.	Using Gauss-Jordan method, find the inverse of the matrix $\begin{pmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{pmatrix}$	BTL -3	Applying
18.	Find the positive real root of xlog_{10} x = 12.34 using Newton – Raphson method start with $x_0 = 10$.	BTL -3	Applying
	PART – C		
1.	Derive the iterative formula for $\sqrt{N}$ where N is positive integer using Newton's method and hence find the value of $\sqrt{142}$.	BTL -4	Analyzing
2.	Solve using Gauss-Seidal method 4x + 2y + z =14, x + 5y - z = 10, x + y + 8z = 20	BTL -4	Analyzing
3.	Find all possible Eigen values by Power method for A = $\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$	BTL -2	Understanding
4.	Using Power method , Find all the Eigen values of $\boldsymbol{A} = \begin{pmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{pmatrix}$	BTL -2	Understanding
5.	Solve by Gauss Elimination method 3.15x -1.96y + 3.85z =12.95 ; 2.13x + 5.12y -2.89z = -8.61; 5.92x +3.05y + 2.15z =6.88.	BTL -3	Applying

UNIT-IV:INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION **9L+3T**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's rules.

PART - A

Q.No	Question	BT Level	Competence
1.	Define interpolation	BTL -1	Remembering
2.	Write down the Lagrange's interpolating formula	BTL -1	Remembering
3.	Create Forward interpolation table for the following data X : 0 5 10 15 Y : 14 379 1444 3584	BTL -1	Remembering
4.	Using Lagrange's formula to fit a polynomial from the data <table><tr><td>X</td><td>0</td><td>1</td><td>3</td></tr><tr><td>Y</td><td>5</td><td>6</td><td>4</td></tr></table>	BTL -1	Remembering
5.	State Newton Gregory forward interpolation formula.	BTL -1	Remembering
6.	Write any two properties of divided differences	BTL -1	Remembering
7.	Find the divided difference table for the following data (0, 0), (1, 2), (2, 2.5), (3, 2.3), (4, 2), (5, 1.7) and (6, 1.5)	BTL -2	Understanding
8.	State the formula to find the first and second order derivative using the forward differences	BTL -2	Understanding
9.	State the formula to find the first and second order derivative using backward differences.	BTL -2	Understanding
10.	Form the divided difference table for the following data: <table><tr><td>X</td><td>5</td><td>15</td><td>22</td></tr><tr><td>Y</td><td>7</td><td>36</td><td>160</td></tr></table>	BTL -2	Understanding
11.	Find the polynomial which takes the following values given	BTL -3	Applying

<table>
<tr><td></td><td>f (0) = -1, f (1) = 1 and f (2) = 4 using the Newton’s interpolating formula</td><td></td><td></td></tr>
<tr><td>12.</td><td>Find the divided difference table for the following data (0,1) , (1, 4), (3,40) and (4,85) .</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>13.</td><td>Find the divided difference table for the following data
X : 4 5 7 10 11 13
f(x) : 48 100 294 900 1210 2028 .</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>14.</td><td>Write the formula of inverse Lagrange’s interpolation formula</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>15.</td><td>Find the divided difference table for the following data<table><tr><td>x</td><td>2</td><td>5</td><td>10</td></tr><tr><td>y</td><td>5</td><td>29</td><td>109</td></tr></table></td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>16.</td><td>Write the Trapezoidal rule to evaluate the single integration .</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>17.</td><td>State the Simpson’s 1/3-rule in numerical integration</td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>18.</td><td>What is the order of error in Trapezoidal and simpson’s one-third rules?</td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>19.</td><td>State Trapezoidal for double integration</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>20.</td><td>State Simpson;s rule for double integration</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>21.</td><td>Calculate $\int_1^4 f(x)dx$ from the table by Simpson’s 1/3 rd rule
x : 1 2 3 4
f(x): 1 8 27 64</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>22.</td><td>Evaluate $\int_{0.5}^{1} \frac{dx}{x}$ by Trapezoidal rule, dividing the range into 4 equal parts</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>23.</td><td>Describe in numerical integration, what should be the number of intervals to apply Simpson’s one – third rule.</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>24.</td><td>Using Trapezoidal rule, evaluate $\int_0^1 \frac{dx}{1+x^2}$ with h = 0.2 hence obtain an approximate value of π</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>25.</td><td>Evaluate $\int_1^2 \frac{dx}{1+x^2}$, using Trapezoidal rule, taking h = 0.5</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td colspan="4">PART - B</td></tr>
<tr><td>1.(a)</td><td>From the following table, find y at x = 6 using Newton’s divided difference formula<table><tr><td>X</td><td>1</td><td>2</td><td>7</td><td>8</td></tr><tr><td>y</td><td>1</td><td>5</td><td>5</td><td>4</td></tr></table></td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>1. (b)</td><td>The population of a certain town is given below. Find the rate of growth of the population in 1931, 1971<table><tr><td>Year (x)</td><td>1931</td><td>1941</td><td>1951</td><td>1961</td><td>1971</td></tr><tr><td>Population i(in 1000)</td><td>40.62</td><td>60.80</td><td>79.95</td><td>103.56</td><td>132.66</td></tr></table></td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>2.</td><td>Find the polynomial using Newton’s forward interpolation formula and also find y(1.5) and y (4), given that<table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>1</td><td>2</td><td>1</td><td>10</td></tr></table></td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>3.</td><td>Calculate $f'(50), f'(56), f''(50)$ and $f''(56)$ from the following table<table><tr><td>x</td><td>50</td><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td><td>56</td></tr><tr><td>f(x)</td><td>3.6840</td><td>3.7084</td><td>3.7325</td><td>3.7563</td><td>3.7798</td><td>3.8030</td><td>3.8259</td></tr></table></td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>4.</td><td>Evaluate $\int_0^2 e^x\,dx$ by using Trapezoidal rule taking 6 subintervals.</td><td>BTL -3</td><td>Applying</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>5.</td><td>Evaluate $\int_0^1 \frac{dx}{1+x^2}$, dividing the range into 4 equal parts using Trapezoidal and Simpson’s rule.</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>6.</td><td>Use Lagrange’s interpolation formula, find the value of f(3) from the following data:
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>5</td></tr>
<tr><td>f(x)</td><td>2</td><td>3</td><td>12</td><td>147</td></tr>
</table></td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>7.</td><td>From the data given below, find f(43) and f(71)
<table>
<tr><td>x</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td></tr>
<tr><td>f(x)</td><td>184</td><td>204</td><td>226</td><td>250</td><td>276</td></tr>
</table></td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>8.</td><td>Using Lagrange’s Interpolation formula, Find the polynomial f(x) form the following data also find f(3)
<table>
<tr><td>x</td><td>0</td><td>1</td><td>4</td><td>5</td></tr>
<tr><td>f(x)</td><td>4</td><td>3</td><td>24</td><td>39</td></tr>
</table></td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>9.</td><td>Find the first and second derivative of the function f(x) at x=1.5 and x = 4
<table>
<tr><td>x</td><td>1.5</td><td>2</td><td>2.5</td><td>3</td><td>3.5</td><td>4</td></tr>
<tr><td>f(x)</td><td>3.375</td><td>7</td><td>13.625</td><td>24</td><td>38.875</td><td>59</td></tr>
</table></td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>10.</td><td>Determine by Lagrange’s interpolation method, find y(10) from the following table
<table>
<tr><td>X</td><td>5</td><td>6</td><td>9</td><td>11</td></tr>
<tr><td>Y</td><td>12</td><td>13</td><td>14</td><td>16</td></tr>
</table></td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>11.</td><td>Use the Newton divided difference formula to calculate f(2), f(8) and f(15) from the following table
<table>
<tr><td>x</td><td>4</td><td>5</td><td>7</td><td>10</td><td>11</td><td>13</td></tr>
<tr><td>f(x)</td><td>48</td><td>100</td><td>294</td><td>900</td><td>1210</td><td>2028</td></tr>
</table></td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>12.</td><td>Find f (x) as a polynomial in x from the following data by using Newton’s divided difference formula and find the value of f (8).
<table>
<tr><td>X</td><td>3</td><td>7</td><td>9</td><td>10</td></tr>
<tr><td>f(x)</td><td>168</td><td>120</td><td>72</td><td>63</td></tr>
</table></td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>13.</td><td>By dividing the range into 10 equal parts, evaluate $\int_0^{\pi} \sin x \, dx$ by Trapezoidal and Simpson’s rule. Verify your answer with integration</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>14.</td><td>Evaluate $\int_1^{1.2} \int_1^{1.4} \frac{1}{1+x} dxdy$ by Trapezoidal rule and Simpson’s $1/3^{rd}$ rule with h = k = 0.1</td><td>BTL -5</td><td>Analyzing</td></tr>
<tr><td>15.</td><td>The velocity V of a particle at distances from a point on its path is given by the table
<table>
<tr><td>T feet</td><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td></tr>
<tr><td>V feet/s</td><td>47</td><td>58</td><td>64</td><td>65</td><td>61</td><td>52</td><td>38</td></tr>
</table>
Estimate the time taken to travel 60 feet by using Trapezoidal and Simpson’s $1/3^{rd}$ rule.</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>16.</td><td>Construct Newton’s forward interpolation polynomial for the following data:
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>f(x)</td><td>1</td><td>-1</td><td>1</td><td>-1</td><td>1</td></tr>
</table></td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>17.</td><td>Find $\int_0^1 \int_0^1 \frac{dx\,dy}{1+xy}$ using Simpson’s one-third rule with h=k=0.25</td><td>BTL -3</td><td>Applying</td></tr>
</table>

18.	Evaluate $\int_0^1 \int_0^1 \frac{dx\,dy}{1+x+y}$ using, Simpson's 1/3 rd rule, given that (i) h = k = 0.25 , (ii) h = k = 0.5.	BTL -3	Applying
	PART-C		
1.	A Jet fighters position on an air craft carries runway was timed during landing t ,sec : 1.0 1.1 1.2 1.3 1.4 1.5 1.6 y , m : 7.989 8.403 8.781 9.129 9.451 9.750 10.03 where y is the distance from end of carrier estimate the velocity and acceleration at t = 1.0.	BTL -4	Analyzing
2.	Evaluate $\int_1^2 \int_1^2 \frac{dx\,dy}{x+y}$ $h = k = 0.25$ using trapezoidal, Simpson's rule, and justify.	BTL -4	Analyzing
3.	The following table gives the values of density of saturated water for various temperature of saturated steam. Find density at the temperature T = 125, and T= 275. Temp $T^{\circ}C$: 100, 150, 200, 250, 300 Density hg/m^3: 958, 917, 865, 799, 712	BTL -2	Understanding
4.	Using Lagrange's interpolation calculate the profit in the year 2000 from the following data : Year: 1997, 1999, 2001, 2002 Profit in lakhs of Rs: 43, 65, 159, 248	BTL -3	Applying
5.	Evaluate $\int_0^1 \int_1^2 \frac{2xy\,dx\,dy}{(1+x^2)(1+y^2)}$ using, Trapezoidal and Simpson's 1/3 rd rule, given that h = k = 0.25.	BTL - 4	Analyzing

UNIT-V: NUMERICAL SOLUTION OF ORDINARYDIFFERENTIAL EQUATIONS 9L+3T

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods : Milne's and Adams -Bash forth predictor corrector methods for solving first order equations.

PART - A

Q.No.	Question	BTL Level	Competence
1.	Give Euler's iteration formula for ordinary differential equation.	BTL -2	Understanding
2.	Estimate $y(1.25)$ if $\frac{dy}{dx} = x^2 + y^2$, $y(1) = 1$ taking $h = 0.25$, using Euler's method.	BTL -5	Evaluating
3.	Estimate $y(0.2)$ given that $y' = x + y$, $y(0) = 1$, using Euler's method.	BTL -5	Evaluating
4.	Using Euler's method, compute y(0.1) given $\frac{dy}{dx} = 1 - y$, y(0) = 0	BTL -2	Understanding
5.	Define initial value problems.	BTL -1	Remembering
6.	Write the Euler's modified formula for solving $\frac{dy}{dx} = f(x,y), y(x_0) = y_0$	BTL -1	Remembering
7.	Using modified Euler's method to find y (0.4) given $y' = xy$, $y(0) = 1$	BTL -5	Evaluating
8.	Write the merits and demerits of the Taylor's method.	BTL -1	Remembering

9.	Find y(0.1), if $\frac{dy}{dx} = y^2 + x$ given $y(0) = 1$, by Taylor series method.	BTL -3	Applying
10.	Using Taylor series formula to find y (x_1) for solving $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$.	BTL -2	Understanding
11.	Using Taylor's series up to x^3 terms for $2y' + y = x + 1$, $y(0) = 1$.	BTL -3	Applying
12.	Using Taylor series for the function $\frac{dy}{dx} = x + y$ when $y(1) = 0$ find y at $x = 1.2$ with $h = 0.1$.	BTL -3	Applying
13.	Explain Runge – Kutta method of order 4 for solving initial value problems in ordinary differential equation.	BTL -1	Remembering
14.	Find k_1 given $y' = xy$, $y(0) = 1$, using R-K method of fourth order.	BTL -3	Applying
15.	Using fourth order Runge – Kutta method to find y (0.1) given $\frac{dy}{dx} = x + y$ y (0) = 1, h = 0.1	BTL -2	Understanding
16.	State Adam- Bashforth predictor and corrector formulae to solve first order ordinary differential equations.	BTL -2	Understanding
17.	State Milne's predictor corrector formula.	BTL -2	Understanding
18.	What are the single step methods available for solving ordinary differential equations.	BTL -1	Remembering
19.	What are the advantages of R-K method over Taylor's method.	BTL -1	Remembering
20.	Prepare the multi-step methods available for solving ordinary differential equation.	BTL -4	Analyzing
21.	Write the Error for Adam- Bashforth predictor and corrector method.	BTL -1	Remembering
22.	Estimate $y(0.1)$ given that $y' = xy$, $y(0) = 2$, using Euler's method.	BTL -5	Evaluating
23.	Using modified Euler's method to find y (0.5) given $y' = x + y$, $y(0) = 1$	BTL -5	Evaluating
24.	Using Taylor series for the function $\frac{dy}{dx} = 2x + 3y$ when $y(1) = 0$ find y at $x = 1.5$ with $h = 0.5$.	BTL -3	Applying
25.	Find k_1 given $y' = x^3 + y$, $y(0) = 1$, using R-K method of fourth order.	BTL -3	Applying
PART - B			
1.(a)	Apply Euler method to find y (0.2) given $\frac{dy}{dx} = y - x^2 + 1$ and y(0) = 0.5.	BTL -3	Applying
1. (b)	Find the values of y at x = 0.1 given that $\frac{dy}{dx} = x^2 - y$, y(0) = 1 by Taylor's series method.	BTL -5	Evaluating
2. (a)	Using Taylor series method find y at x = 0.1 given $\frac{dy}{dx} = x^2 y - 1$, y (0) = 1.	BTL -3	Applying
2.(b)	Using Euler Method to find y(0.2) and y(0.4) from $\frac{dy}{dx} = x + y$, y (0) = 1 with h = 0.2.	BTL -3	Applying

3.	Examine 2y' –x – y = 0 given y(0) = 2 , y(0.5) = 2.636, y(1) = 3.595, y(1.5) = 4.968 to get y(2) by Adam's method.	BTL -4	Analyzing
4.	By Euler method for the function $\frac{dy}{dx}=\log_{10}(x+y)$, y(0) = 2 find the values of y(0.2) y(0.4) and y(0.6) by taking h = 0.2.	BTL -3	Applying
5.(a)	Find y(2) by Milne's method $\frac{dy}{dx}=\frac{1}{2}(x+y)$, given y(0) = 2 , y(0.5) = 2.636, y(1.0) = 3.595 and y(1.5) = 4.968.	BTL -3	Applying
5.(b)	Interpret y(0.1) given $\frac{dy}{dx}=x^2+y^2$ y(0) =1 using modified Euler methods.	BTL -3	Applying
6. (a)	Given $\frac{dy}{dx}= x^2(1+y)$, y(1) = 1 , y(1.1) = 1.233, y(1.2) = 1.548 , y(1.3) = 1.979, evaluate y(1.4) By Adam's Bash forth predictor corrector method.	BTL -5	Evaluating
6.(b)	Solve the equation $\frac{dy}{dx}=\log(x+y)$, y(0) = 2 find y at x = 0.2 using Modified Euler's method .	BTL -4	Analyzing
7.	Evaluate the value of y at x = 0.2 and 0.4 correct to 3decimal places given $\frac{dy}{dx}=xy^2+1$, y(0) =1, using Taylor series method	BTL -5	Evaluating
8. (a)	Calculate y(0.4) by Milne's predictor – corrector method , Given $\frac{dy}{dx}=\frac{1}{2}(1+x^2)y^2$ and y(0) = 1, y(0.1) = 1.06, y(0.2) = 1.12, y(0.3) = 1.21,	BTL -5	Evaluating
8.(b)	Find the values of y at x = 0.1 given that $\frac{dy}{dx}=x^2-y$, y(0) = 1 by modified Euler method.	BTL -4	Analyzing
9.	Find y(4.4) given 5xy' + y^2 – 2 = 0 , y(4) = 1; y(4.1) =1.0049; y(4.2) = 1.0097 ; and y(4.3) =1.0143. Using Milne's method.	BTL -4	Analyzing
10.	Find y(0.4) by Milne's method, Given $\frac{dy}{dx}=xy+y^2$, y(0) = 1, y(0.1) = 1.1169, y(0.2) = 1.2773 Find i) y(0.3) by Runge –kutta method of 4th order and ii) y(0.4) by Milne's method.	BTL -3	Applying
11	Solve $\frac{dy}{dx}=1-y$ with the initial condition x= 0, y= 0 using Euler's algorithm and tabulate the solutions at x= 0.1, 0.2, 0.3, 0.4. Using these results, Find y(0.5) using Adam's – Bash forth Predictor and corrector method.	BTL -3	Applying
12.	Solve $\frac{dy}{dx}=y^2+x$, y(0)=1 (i) By modified Euler method at x=0.1 and x = 0.2. (ii) By Fourth order R-K method at x = 0.3 (iii) By Milne's Predictor-Corrector method at x = 0.4.	BTL -3	Applying
13.	Using Milne's method find y(2) if y(x) is the solution of , $\frac{dy}{dx}=\frac{1}{2}(x+y)$, given y(0) =2, y(0.5) =2.636, y(1) = 3.595 and y(1.5) =4.968.	BTL -3	Applying
14.	Apply fourth order Runge-kutta method, to find an approximate value of y when x= 0.2 given that y'= x + y , y(0)=1 with h=0.2.	BTL -3	Applying
15.	Using Taylor series method find y at x = 0.1, x=0.2 , y (0) = 1,	BTL -3	Applying

	given $\frac{dy}{dx} = x + y$.		
16.	Using Euler Method to find y(0.3) and y(0.4) from $\frac{dy}{dx} = \frac{1}{2}(x^2+1)y^2$, y (0.2) = 1.1114 with h = 0.1.	BTL -3	Applying
17.	Apply fourth order Runge-kutta method, to find an approximate value of y when x= 0.1 given that y'= x + y^2, y(0)=1 with h=0.1.	BTL -3	Applying
18.	Apply fourth order Runge-kutta method, to find an approximate value of y when x= 0.2 given that $y' = \frac{y^2-x^2}{y^2+x^2}$, y(0)=1 with h=0.2.	BTL -3	Applying
PART-C			
1.	Apply Milne's method find y(0.4) given $\frac{dy}{dx} = xy + y^2$, y(0) =1 ,using Taylor series method find y(0.1) , Euler Method to find y(0.2) and y(0.3)	BTL -3	Applying
2.	By Adam's method, find y (4.4) given, 5xy' + y^2 = 2 , y(4) = 1; Find y(4.1), y(4.2), y(4.3) by Euler's method.	BTL -5	Evaluating
3.	Apply Runge – Kutta method of order 4 solve y' = y-x^2, with y(0.6) = 1.7379, h= 0.2 find y(0.8).	BTL -3	Applying
4.	Using Adam's – Bash forth method and Milne's method, find y(0.4) given $\frac{dy}{dx} = \frac{xy}{2}$, y(0) = 1, y(0.1) =1.01, y(0.2) = 1.022, and y(0.3) = 1.023.	BTL -5	Evaluating
5.	Interpret y(1.2) given $\frac{dy}{dx} = (y - x^2)^3$ y(1) =0 , take h = 0.2 using (i) Euler methods, (ii) Modified Euler methods.	BTL -3	Applying