

**END SEMESTER EXAMINATION (ESE), Jan. – 2023**

Course Name: **Engineering Mathematics III**, Course Code: **201CHL201**

**Day: Monday & Date: 16/1/2023**

**Time: 2.00 pm to 4.00 pm.**

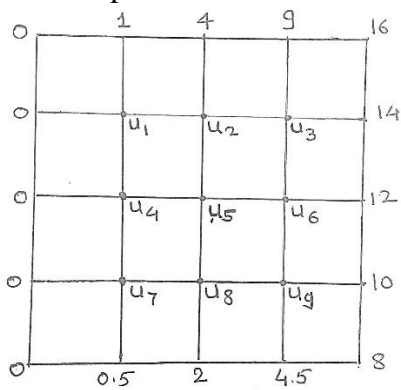
Seat No:

**Max. Marks- 50**

**Instructions:**

- Figure to the right indicate full marks.
- Use of a nonprogrammable calculator is allowed.

| BT     | CO's   | Q. No. | Statement of Question  | Marks |     |    |   |   |   |   |        |     |     |     |     |     |    |     |
|--------|--------|--------|--|-------|-----|----|---|---|---|---|--------|-----|-----|-----|-----|-----|----|-----|
|        |        | Q.1    | Attempt the following questions.   | 20    |     |    |   |   |   |   |        |     |     |     |     |     |    |     |
| L 3    | C201.1 | a      | Solve $(D^4 + 10D^2 + 9)y = \cos(2x + 3)$  | 5 M   |     |    |   |   |   |   |        |     |     |     |     |     |    |     |
| L3     | C201.2 | b      | A random variable X has the following probability distribution<br><table><tr><td>X</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>P(X=x)</td><td>0.1</td><td>k</td><td>0.2</td><td>2k</td><td>0.3</td><td>3k</td></tr></table><br>Find i) k ii) $P(X \geq 2)$ iii) $P(-2 < X < 2)$ | X     | -2  | -1 | 0 | 1 | 2 | 3 | P(X=x) | 0.1 | k   | 0.2 | 2k  | 0.3 | 3k | 5 M |
| X      | -2     | -1     | 0  | 1     | 2   | 3  |   |   |   |   |        |     |     |     |     |     |    |     |
| P(X=x) | 0.1    | k      | 0.2  | 2k    | 0.3 | 3k |   |   |   |   |        |     |     |     |     |     |    |     |
| L3     | C201.3 | c      | Find Laplace Transform of $t e^{-4t} \sin 3t$  | 5 M   |     |    |   |   |   |   |        |     |     |     |     |     |    |     |
| L3     | C201.3 | d      | Find Inverse Laplace Transform of $\frac{1}{(s+1)(s-2)}$   | 5 M   |     |    |   |   |   |   |        |     |     |     |     |     |    |     |
|        |        | Q.2    | Attempt any TWO of the following questions.  | 10    |     |    |   |   |   |   |        |     |     |     |     |     |    |     |
| L3     | C201.4 | a      | From 8 observations the following results were obtained:<br>$\sum x = 59, \sum y = 40, \sum x^2 = 524, \sum y^2 = 256, \sum xy = 364$ , Find the equation of the line of regression of x on y and the coefficient of correlation.  | 5 M   |     |    |   |   |   |   |        |     |     |     |     |     |    |     |
| L3     | C201.4 | b      | Fit a parabola to the following data:<br><table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>y</td><td>1.0</td><td>1.8</td><td>1.3</td><td>2.5</td><td>6.3</td></tr></table>   | x     | 0   | 1  | 2 | 3 | 4 | y | 1.0    | 1.8 | 1.3 | 2.5 | 6.3 | 5 M |    |     |
| x      | 0      | 1      | 2  | 3     | 4   |    |   |   |   |   |        |     |     |     |     |     |    |     |
| y      | 1.0    | 1.8    | 1.3  | 2.5   | 6.3 |    |   |   |   |   |        |     |     |     |     |     |    |     |

|      |          |            |  |           |          |          |      |    |     |     |    |    |     |
|------|----------|------------|--|-----------|----------|----------|------|----|-----|-----|----|----|-----|
| L3   | C201.4   | c          | Given the following information<br><table><tr><td></td><td>x series</td><td>y series</td></tr><tr><td>Mean</td><td>18</td><td>100</td></tr><tr><td>S.D</td><td>14</td><td>20</td></tr></table><br>Coefficient of correlation $r=0.8$ . Find the most probable value of $y$ when $x=70$ . |           | x series | y series | Mean | 18 | 100 | S.D | 14 | 20 | 5 M |
|      | x series | y series   |  |           |          |          |      |    |     |     |    |    |     |
| Mean | 18       | 100        |  |           |          |          |      |    |     |     |    |    |     |
| S.D  | 14       | 20         |  |           |          |          |      |    |     |     |    |    |     |
|      |          | <b>Q.3</b> | <b>Attempt any TWO of the following.</b>   | <b>10</b> |          |          |      |    |     |     |    |    |     |
| L3   | C201.5   | a          | If a vector $\vec{F} = (x + 3y)i + (y - 2z)j + (az + x)k$ is solenoidal, find the value of $a$ .   | 5 M       |          |          |      |    |     |     |    |    |     |
| L3   | C201.5   | b          | Find the angle between the normals to the surface $xy = z^2$ at the points $(1,4,2)$ & $(-3,-3,3)$ .   | 5 M       |          |          |      |    |     |     |    |    |     |
| L3   | C201.5   | c          | If $\vec{F} = (x+y+1) i + j - (x+y) k$ . Prove that $\vec{F} \cdot \text{curl } \vec{F} = 0$   | 5 M       |          |          |      |    |     |     |    |    |     |
|      |          | <b>Q.4</b> | <b>Attempt the following questions .</b>   | <b>10</b> |          |          |      |    |     |     |    |    |     |
| L3   | C201.6   | a          | Solve $p^2 + q^2 = 1$ .  | 3 M       |          |          |      |    |     |     |    |    |     |
| L3   | C201.6   | b          | Solve the Laplace Equation $u_{xx} + u_{yy}=0$ for the following square mesh with boundary values as shown. Using Gauss-Seidel Iteration process obtain the values up to two iterations.<br>          | 7 M       |          |          |      |    |     |     |    |    |     |
|      |          |            | <b>OR</b>  |           |          |          |      |    |     |     |    |    |     |
| L3   | C201.6   | b          | Solve $(y-z) p + (z-x) q = x-y$  | 7 M       |          |          |      |    |     |     |    |    |     |

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