

Enrollment No./Seat No.:

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025**

**Subject Code: 130001**

**Date: 12-12-2025**

**Subject Name: Mathematics-III**

**Time: 10:30 AM TO 01:30PM**

**Total Marks: 70**

**Instructions**

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

|                                                                                                    | <b>Marks</b> |
|----------------------------------------------------------------------------------------------------|--------------|
| <b>Q.1 (a)</b> Compute $\beta\left(\frac{9}{2}, \frac{7}{2}\right)$                                | <b>07</b>    |
| <b>(b)</b> Find the series solution of $y' - 2xy = 0$                                              | <b>07</b>    |
| <b>Q.2 (a)</b> Solve $y'' + y' - 12y = e^{6x}$                                                     | <b>07</b>    |
| <b>(b)</b> Test the exactness and solve $(x^4 - 2xy^2 + y^4) dx - (2x^2y - 4xy^3 + \sin y) dy = 0$ | <b>07</b>    |
| <b>OR</b>                                                                                          |              |
| <b>(b)</b> Solve $\frac{dy}{dx} + y \sin x = e^{\cos x}$                                           | <b>07</b>    |
| <b>Q.3 (a)</b> Solve $y'' + y = \sin x$ by using method of variation of parameters.                | <b>07</b>    |
| <b>(b)</b> Find the half range sine series of $f(x) = x^2$ in the interval $(0, \pi)$              | <b>07</b>    |
| <b>OR</b>                                                                                          |              |
| <b>(a)</b> Solve $x^2y'' - 20y = 0$                                                                | <b>07</b>    |
| <b>(b)</b> Find the fourier series of $f(x) = x$ in the interval $(0, 2\pi)$                       | <b>07</b>    |
| <b>Q.4 (a)</b> Find $L\{t \cos at\}$                                                               | <b>07</b>    |

**(b)** Find  $L^{-1} \left\{ \frac{s+2}{s(s+1)(s+3)} \right\}$  **07**

**OR**

**(a)** Find  $L \left\{ \int_0^t e^{-2t} t^3 dt \right\}$  **07**

**(b)** Solve  $\frac{dy}{dx} + 2y = e^{-3t}, y(0) = 1$  by using Laplace transform **07**

**Q.5 (a)** Solve  $xp + yq = 3z$  **07**

**(b)** Solve  $p^2 + q^2 = x^2 + y^2$  **07**

**OR**

**(a)** Solve  $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = e^{x+4y}$  **07**

**(b)** Using the method of separation of variables, solve  $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$  given that  $u(x, 0) = 6e^{-3x}$  **07**

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