Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III(OLD) EXAMINATION – SUMMER 2023
Subject Code:130002   **Date:21-07-2023**
Subject Name:Advanced Engineering Mathematics
Time:02:30 PM TO 05:30 PM   **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.**

			MARKS
Q.1	**(a)**	Find the Fourier series of $f(x) = x + |x|$ in the interval $-\pi < x < \pi$	07
	(b)	Solve $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = \log x . \sin(\log x)$	07
Q.2	**(a)**	(i) Solve $\frac{dy}{dx} + 2y \tan x = \sin x$	03
		(ii) Solve $(D^2 + a^2)y = \cos ax$ by the method of variation of parameter	04
	(b)	Solve $\frac{d^3y}{dx^3} + 8y = \cosh 2x$	07

OR

	(b)	(i) Find the Laplace transform of $e^{-3t}(2\cos 5t - 3\sin 5t)$.	03
		(ii) Find the Inverse Laplace transform of $\frac{3s+7}{s^2-2s-3}$	04

Q.3	**(a)**	(i) Define	03
		1. Gamma Function 2. Beta Function 3. Signum Function	
		(ii) Find half range $cosine$ series for $f(x) = x, \ 0 < x < 3$.	04
	(b)	Find the power series solution of the equation $(x^2 + 1)y'' + xy' - xy = 0$ about $x = 0$	07

OR

Q.3	**(a)**	(i) Solve $(x + 1)\frac{dy}{dx} - y = e^{3x}(x + 1)^2$	03
		(ii) Solve by using Undetermined Coefficient method $(D^2 - 2D + 3)y = x^3 + \sin x$	04
	(b)	Find the series solution of $2x(x - 1)y'' - (x + 1)y' + y = 0; x_0 = 0$	07

Q.4 **(a)** Find the Inverse Laplace transform of $\dfrac{5s+3}{(s-1)(s^2+2s+5)}$ **07**

(b) Solve $2\dfrac{\partial u}{\partial x} = \dfrac{\partial u}{\partial t} + u$ subject to the condition $u(x,0) = 4e^{-3x}$ by method of separation of variables.   **07**

OR

Q.4 **(a)** Solve $\dfrac{d^2x}{dt^2} + 2\dfrac{dx}{dt} + 5x = e^{-t}sint$, where $x(0) = 0$ & $x'(0) = 1$.   **07**

(b) (i) Solve $p^2 + q^2 = npq$ **03**
     (ii) Solve $pz - qz = z^2 + (x+y)^2$ **04**

Q.5 **(a)** Find the Inverse Laplace transform of $\dfrac{s+2}{(s^2+4s+5)^2}$ using Convolution Method.   **07**

(b) Obtain the Fourier series of $f(x) = \dfrac{1}{2}(\pi - x)$ in the interval $0 \le x \le 2\pi$.   **07**

OR

Q.5 **(a)** (i) Form a partial differential equation by eliminating the arbitrary functions from $xyz = \emptyset(x+y+z)$ **03**
     (ii) Find the Laplace transform of $cos3t.cos2t.cost$ **04**

(b) Find the series solution   **07**
$(x-2)\dfrac{d^2y}{dx^2} - x^2\dfrac{dy}{dx} + 9y = 0$ about $x_0 = 0$

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