Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III(NEW) EXAMINATION – WINTER 2022

Subject Code:2130002 Date:16-02-2023

Subject Name:Advance 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)**	Solve $(y^2 - x^2)dx + (2xy)dy = 0$	**03**
	(b)	Solve $x^2 \frac{dy}{dx} + xy = x^4y^6$	**04**
	(c)	Solve $y'' + 2y' + 5y = e^{-t}\sin t,\ y(0) = 0, y'(0) = 1$ using Laplace transform.	**07**
Q.2	**(a)**	Solve $\frac{d^4y}{dx^4} + 4y = 0$.	**03**
	(b)	Solve $y'' + 4y = \sin 3x$.	**04**
	(c)	Find the Fourier series of $f(x) = x + x^2$ in $-\pi < x < \pi$.	**07**
		OR	
	(c)	Find the Fourier series for the function $f(x) = \begin{cases} -\pi\ ; & -\pi < x < 0 \\ x\ ; & 0 < x < \pi \end{cases}$.	**07**
Q.3	**(a)**	Find $L\{\sin(3t + 2)\}$.	**03**
	(b)	Find $L^{-1}\left\{\frac{1}{(s+1)(s^2+1)}\right\}$.	**04**
	(c)	Find the power series solution of $y'' + x^2y = 0$.	**07**
		OR	
Q.3	**(a)**	Find $L\{t\ sinh\ 3t\}$.	**03**
	(b)	Find $L^{-1}\left\{tan^{-1}\left(\frac{2}{s}\right)\right\}$.	**04**
	(c)	Using the method of variation of parameters, solve $y'' - 4y' + 4y = \frac{e^{2x}}{x}$.	**07**
Q.4	**(a)**	Solve $y'' + 6y + 9y = e^{3x}$.	**03**
	(b)	Solve $(D^3 - D^2 - 6D)y = x^2 + 1$.	**04**
	(c)	Using convolution theorem find the inverse Laplace transform of $\frac{1}{(s^2+a^2)^2}$.	**07**
		OR	
Q.4	**(a)**	Find the convolution of t and e^t.	**03**
	(b)	Find the Laplace transform of $\frac{\cos at - \cos bt}{t}$.	**04**
	(c)	Find the Fourier series for the function $f(x) = 2x - x^2$ with period 3 in the range (0, 3).	**07**
Q.5	**(a)**	Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$.	**03**
	(b)	Solve $p(1 + q) = qz$.	**04**

(c) Solve $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial y^2} = \cos 2x \cos 3y$. **07**

OR

Q.5 **(a)** Form the partial differential equation from $z = f\left(\frac{x}{y}\right)$. **03**

(b) Solve $\frac{\partial^2 z}{\partial x^2} + z = 0$ given that $z = e^y, \frac{\partial z}{\partial x} = 1$ when $x = 0$. **04**

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

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