Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – SUMMER 2025

Subject Code:2130002 Date:11-06-2025

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 $\frac{dy}{dx} + (cotx)y = 2cosx$	**03**
	(b)	Give Beta and Gamma function relationship and find $\beta(\frac{9}{2}, \frac{7}{2})$	**04**
	(c)	Give the Statement of Convolution Theorem and find the Inverse Laplace transform of $\frac{s+2}{s^2(s+3)}$	**07**
Q.2	**(a)**	Check the Exactness of $(x^3 + 3xy^2)dx + (3x^2y + y^3)dy = 0$	**03**
	(b)	Solve $\frac{dy}{dx} + \frac{2y}{x} = x^2y^2$	**04**
	(c)	Find the Fourier Series of $f(x) = \begin{cases} -\pi & -\pi < x < 0 \\ x & 0 < x < \pi \end{cases}$	**07**
		OR	
	(c)	Solve the Initial –Value problem using Laplace transform $y'' + 3y' + 2y = e^t$, y(0)=1, $y'(0) = 0$	**07**
Q.3	**(a)**	Using the definition of Laplace transform prove that (1)$L(t^n) = \frac{n!}{s^{n+1}}$ (2)$L(e^{-at}) = \frac{1}{s-a}$	**03**
	(b)	Form the partial differential equation of $z = f(\frac{x}{y})$	**04**
	(c)	Using Method of Variation of parameter solve $(D^2 + 4)y = tan2x$	**07**
		OR	
Q.3	**(a)**	Find $L(te^{4t}cos2t)$	**03**
	(b)	Using Partial differential equation eliminate the function f from the relation $f(xy + z^2$,x+y+z)=0	**04**
	(c)	Using Method of Undetermined coefficient solve $(D^2 - 2D)y = e^x(sinx)$	**07**
Q.4	**(a)**	Find the Fourier Sine series of $f(x) = 2x \; in \; 0 < x < 1$	**03**
	(b)	If $L\big(f(t)\big) = \log\left(\frac{s+3}{s+1}\right)$ find $L\big(f(2t)\big)$ using change of scale property of Laplace transform.	**04**
	(c)	Solve $(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0$	**07**

OR

Q.4 **(a)** Find the Fourier Cosine integral of $f(x) = \frac{\pi}{2}e^{-x}, x \geq 0$ **03**

(b) State First Shifting theorem of Laplace transform and using it find $L(e^{-3t}t^4)$ **04**

(c) Using Cauchy-Euler equation **07**

$$x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \sin(logx)$$

Q.5 **(a)** Find the general solution to the partial differential equation **03**

$xp + yq = x - y$

(b) Solve $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial^2 z}{\partial x.\partial y} + 2\frac{\partial^2 z}{\partial y^2} = x + y$ **04**

(c) Discuss about ordinary point ,singular point and its types for the differential equation **07**

$x^3(x-1)y'' + 3(x-1)y' + 7xy = 0$

OR

Q.5 **(a)** Solve $p(1+q) = qz$ **03**

(b) Solve $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial^2 x.\partial y} = 2e^{2x}$ **04**

(c) Find the Power Series solution of **07**

$(1+x^2)y'' + xy' - 9y = 0$

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