Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – WINTER 2023

Subject Code:2130002 Date:02-02-2024

Subject Name:Advance Engineering Mathematics

Time:10:30 AM TO 01:30 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)**	Define Gamma function, Beta function and Dirac's Delta function	**03**
	(b)	Find the Fourier integral representation, of the fuction f(x) =1 $\|x\|<1$ = 0 $\|x\|>1$	**04**
	(c)	Find Fourier Series expansion of $f(x) = x^2$, $-\pi < x < \pi$	**07**
Q.2	**(a)**	Evaluate: $L\left\{t\int_0^t e^{-4t}\sin 3t\,dt\right\}$.	**03**
	(b)	Find the inverse Laplace transform of $\frac{1}{s(s^2-3s+3)}$.	**04**
	(c)	Solve differential equation, using Laplace Transform $y'' + 6y' = 1 \quad y(0) = 2 \quad y'(0) = 0$.	**07**
		OR	
	(c)	Define Convolution Theorem and use it to find Laplace Transform of $\frac{1}{s^2(s+5)}$, $\frac{1}{s(s^2+4)}$.	**07**
Q.3	**(a)**	Solve the following Differential equations: 1) $ye^x\,dx + (2y + e^x)dy = 0$ 2) 9yy' + 4x = 0	**03**
	(b)	Solve the following equations : (a) $(D^2 + 3D+2)\,y = x\,e^x\,sinx$	**04**
	(c)	1) Solve by using method of variation of parameters: y''+ y = sinx.	**04**
		2) Find the wronskian of the given bases 1) $x^4, x^4 \ln x$ 2) e^{3x}, xe^{3x}	**03**
		OR	
Q.3	**(a)**	Use method of undetermined coefficient to solve $y'' + 4y = 8x^2$.	**03**
	(b)	Solve the following equations: (a) $(D^2 - 4D - 5)y = xe^{2x} + 3cos4x$.	**04**
	(c)	Find a general solution of $(4x^2D^2 + 16xD + 9)y = 0$.	**07**
Q.4	**(a)**	Find the laplace transform of $\frac{cosat - cosbt}{t}$ and $e^{-5t}sint$.	**03**

(b) Find Ordinary point, Singular point, Regular singular and irregular singular point of the following differential equation **04**

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

(c) Find the Power Series solution about $x = 0$ of the equation $y'' + xy = 0$. **07**

OR

Q.4 **(a)** Find the Laplace Transform of f(t) = e^t $0 < t < 2\pi$ **03**
if f(t) = f(t + 2 π)

(b) If $y_1 = x$ is one solution of $x^2y'' + xy' - y = 0$,find the second solution. **04**

(c) Find the Series solution of the equations by Frobenius method **07**
$2x(1-x)y'' + (1-x)y' + 3y = 0$ about $x_0 = 0$

Q.5 **(a)** Solve the following Partial Differential Equations **03**
$(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$

(b) Solve the following nonlinear Partial Differential Equations **04**
1) $p^2 + q^2 = x + y$ 2) p q = p + q

(c) Evaluate $(D^2 + DD' - 6D')z = \sin(2x + y)$ **07**

OR

Q.5 **(a)** Form Partial Differential Equations by eliminating arbitrary function **03**
z = f(x + ct) + g(x – ct)

(b) Solve the following Partial Differential Equations by Direct integration method **04**

1) $\frac{\partial^2 z}{\partial x \partial y} = \cos x \cos y$

(c) Solve: $\frac{\partial z}{\partial x} = 4\frac{\partial z}{\partial y}$ where z(*0* , *y)* = *8* e^{-3y} using method of separation of variables **07**

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