Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–I & II(NEW)EXAMINATION – SUMMER 2022

Subject Code:3110015   **Date:22-08-2022**

Subject Name:Mathematics - 2

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)	Find the Laplace transform of $t^2 e^{-3t}$.	03
	(b)	Define conservative vector field and potential function.	04
	(c)	Solve $y''' - 3y'' + 3y' - y = 4e^x$ using the method of undetermined coefficients.	07
Q.2	(a)	Find the divergence of $\mathbf{F} = (x^2 - y)\mathbf{i} + (xy - y^2)\mathbf{j}$.	03
	(b)	Find Fourier cosine integral of $f(x) = e^{-kx} (x > 0, k > 0)$	04
	(c)	Integrate $f(x, y, z) = 3x^2 - 2y + z$ over the line segment C joining the origin to the point $(2,2,2)$.	07

OR

	(c)	Write Green's theorem. Evaluate the integral $\oint_C \{xy dy - y^2 dx\}$ where C is the square cut from the first quadrant by the lines $x = 1$ and $y = 1$.	07

Q.3	(a)	Obtain convolution of t and e^t.	03
	(b)	Find the Laplace transform of $\frac{\cos at - \cos bt}{t}$.	04
	(c)	Solve the initial value problem $y'' - y' - 2y = 0, y(0) = 1, y'(0) = 0$ using Laplace transform.	07

OR

Q.3	(a)	Find the inverse Laplace transform of $\frac{s-4}{s^2-4}$.	03
	(b)	State second shifting theorem and find the inverse Laplace transform of the function $\frac{se^{-\pi s}}{s^2+1}$.	04
	(c)	State convolution theorem and using it obtain the inverse Laplace transform of $\frac{1}{s(s^2+4)}$.	07

Q.4	(a)	Solve $\frac{dy}{dx} - 2y = 4 - x$.	03
	(b)	Solve $p^2 + 2py \cot x = y^2$.	04
	(c)	Solve $y'' + 4y = 4\tan 2x$ using the method of variation of parameters.	07

OR

Q.4	(a)	Find particular solution of $y'' - 2y' + y = \cos 3x$.	03
	(b)	Solve $x^2 y'' - 3xy' + 4y = 0$	04

(c) Solve the initial value problem 07
$$y''' + y' = 0,$$
$$y(0) = 0, y'(0) = 1, y''(0) = 2$$

Q.5 (a) Write Legendre's and Bessel's differential equations. 03
(b) Solve the differential equation 04
$$(y\cos x + 2xe^y) + (\sin x + x^2 e^y - 1)y' = 0$$
(c) Find the power series solution of the equation $(x^2 + 1)y'' + xy' - xy = 0$ in powers of x. 07

OR

Q.5 (a) Write Legendre polynomials of degree one and two. 03
(b) Solve $y = 2px + p^2 y$. 04
(c) Solve $x(x-1)y'' + (3x-1)y' + y = 0$ about $x = 0$ using Frobenius method. 07

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