Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–I&II EXAMINATION – SUMMER 2025

Subject Code:3110015 Date:07-07-2025

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.**

Q.1 (a)	Show that $\bar{F} = (y^2 - z^2 + 3yz - 2x)\vec{\imath} + (3xz + 2xy)\vec{\jmath} + (3xy - 2xz + 2z)\vec{k}$ is both solenoidal and irrotational.	**03**
(b)	Find Fourier integral representation of function $f(x) = \begin{cases} 1 & \lvert x\rvert < 1 \\ 0 & \lvert x\rvert > 1 \end{cases}$ Hence, Evaluate $\int \frac{sin\omega cos\omega x}{\omega} d\omega$.	**04**
(c)	Verify Green's theorem in the plane for $\int_c [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$, where C is the boundary of the region bounded by $x = 0, y = 0, x + y = 1$.	**07**
Q.2 (a)	Solve $ye^x dx + (2y + e^x)dy = 0$	**03**
(b)	Find the directional Derivative of $\emptyset = xy^2 + yz^2$ at the point $(2, -1, 1)$ in the direction of the vector $\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$.	**04**
(c)	Find the power series solution of $\frac{d^2y}{dx^2} + xy = 0$.	**07**
	OR	
(c)	Find the series solution of $(1 - x^2)y" - 2xy' + 2y = 0$	**07**
Q.3 (a)	Solve $(4D^2 - 4D + 1)y = e^{\frac{x}{2}}$	**03**
(b)	Solve $(D^2 + 6D + 8)y = \cos^2 x$	**04**
(c)	Solve $(D^2 - 2D + 3)y = x^3 + sinx$ by using the method of undetermined coefficients	**07**
	OR	
Q.3 (a)	Solve $(D^2 + a^2)y = cosax$	**03**
(b)	Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = e^x sinx + 7$	**04**
(c)	Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = logx.\sin(logx)$ by Cauchy's linear equation	**07**

Q.4 (a)	Find the Laplace Transform Of $f(t) = sinhat.$	**03**
(b)	Find the Laplace Transform of $te^{4t}cos2t.$	**04**
(c)	Solve the differential equation using initial value problem $y" + 6y' = 1, y(0) = 2, y'(0) = 0.$	**07**

OR

Q.4 (a)	Find the inverse Laplace transform of $log\frac{(s^2+b^2)}{(s^2+a^2)}$	**03**
(b)	Find the Laplace Transform of $\frac{e^{-2t}sin2tcosht}{t}$	**04**
(c)	Find the Inverse Laplace Transform Of $\frac{5s+3}{(s-1)(s^2+2s+5)}$	**07**

Q.5 (a)	Solve $\frac{dy}{dx} + ycotx = 2cosx$	**03**
(b)	Solve $3x^4p^2 - xp - y = 0$	**04**
(c)	Using the method variation of parameter solve the differential equation $(D^2 + 1)y = xsinx$	**07**

OR

Q.5 (a)	Solve $(xy - 2y^2)dx - (x^2 - 3xy)dy = 0$	**03**
(b)	Solve $\frac{dy}{dx} + \frac{1}{x}y = \frac{y^2}{x^2}$	**04**
(c)	Solve $(D^4 - 16)y = e^{2x} + x^4$	**07**

* * *