Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 2 – EXAMINATION – SUMMER 2026

Subject Code: BE02000011 /BE02R00011 **Date: 19/06/2026**

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)**	Define Analytic function & write two examples of analytic function.	**03**
	(b)	Solve $\frac{dy}{dx} + y = x$.	**04**
	(c)	Define Eigen value, Eigen vector and compute it for the matrix $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$.	**07**
Q.2	**(a)**	State Cauchy-Goursat theorem.	**03**
	(b)	Solve $y'' + y' - 2y = 0, y(0) = 4, y'(0) = -5$.	**04**
	(c)	Compute $\int_C \bar{z}dz$ from 0 to 4+2 i along the curve $C : z = t^2 + ti$.	**07**
		OR	
Q.2	**(c)**	Prove that cos (z) is analytic at everywhere.	**07**
Q.3	**(a)**	Define Exact Differential equation.	**03**
	(b)	Use Gauss Jordan elimination method to solve the following linear system : $x - 2y + 3z = 2, -x + y - 2z = -2, 2x - y + 3z = 4$.	**04**
	(c)	Define Harmonic function. Check whether $u(x, y) = e^x cosy$ is harmonic or not. If so, construct the analytic function $f(z) = u + iv$.	**07**
		OR	
Q.3	**(a)**	Write the necessary and sufficient conditions for the Exact differential equation.	**03**
	(b)	Define Rank of the matrix and find the Rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 3 & 5 & 7 & 9 \\ 3 & 6 & 9 & 12 \\ -1 & -2 & -3 & -4 \end{bmatrix}$	**04**
	(c)	Write definition of Differentiation for complex Function. Using the definition, find the derivative of $f(z) = z^3 - 2z$ at $z = -1$.	**07**
Q.4	**(a)**	Solve $(x^2 + y^2 + x)dx + xydy = 0$.	**03**
	(b)	Use Gauss Jordan method to calculate the inverse of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 3 & 1 \\ 1 & -1 & 0 \end{bmatrix}$	**04**
	(c)	Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in a Laurent series for the region $(a) 1 < \lvert z \rvert < 3$ $(b) \lvert z + 1 \rvert < 2$.	**07**
		OR	

Q.4 **(a)** Write Bernoulli's Equation and solve $\frac{dy}{dx} = y^3 - \frac{y}{x}$. **03**

(b) State Cayley-Hamilton theorem & Find inverse of the matrix A using it, where $A = \begin{bmatrix} 4 & 1 \\ 7 & 2 \end{bmatrix}$. **04**

(c) State Cauchy's Integral formula and Compute $\oint_C \frac{e^z}{z(1-z)^3} dz$ where $C : |z-1| = \frac{1}{2}$. **07**

Q.5 **(a)** Solve $xp^2 - (x-1)^2 = 0$. **03**

(b) Solve $x^2 y'' - xy' + y = sin(logx)$. **04**

(c) Use method of Variation of parameter to solve $y'' + 4y = sec(2x)$. **07**

OR

Q.5 **(a)** Define Clairaut's equation and solve $tan(y - px) = p$. **03**

(b) Use undetermined coefficient method to solve $y'' + y' - 12y = e^x$ **04**

(c) Find the power series solution of $(1 + x^2) y'' + xy' - 9y = 0$ about $x = 0$. **07**

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