

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 1 – EXAMINATION – SUMMER 2026

Subject Code: 3110019

Date: 10/07/2026

Subject Name: Remedial Mathematics

Time: 10:30 AM TO 01:00 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 exponential function and logarithmic function 03
- (b) Find the limits: (a) $\lim_{x \rightarrow 1} \frac{x^2+1}{x+99}$ (b) $\lim_{x \rightarrow 1} \frac{x^{15}-1}{x^{10}-1}$ 04
- (c) Solve $(x^4 + y^4)dx - xy^3 dy = 0$ 07
- Q.2** (a) Evaluate the determinant $A = \begin{vmatrix} 1 & -2 & 3 \\ 0 & 2 & 4 \\ 0 & 1 & -1 \end{vmatrix}$ 03
- (b) Find $A.B$ if $A = \begin{bmatrix} 5 & 8 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 4 \\ 3 & 2 & 0 \end{bmatrix}$ 04
- (c) (i) Solve $\frac{dy}{dx} + 2y \tan x = \sin x$ 07
(ii) Derive $\sin 2x = 2 \sin x \cdot \cos x$
- OR
- Q.2** (c) (i) Find $\frac{dy}{dx}$, if $x = a \cos \theta, y = a \sin \theta$ 07
(ii) Derive the trigonometry identity: $\cos 2x = \cos^2 x - \sin^2 x$
- Q.3** (a) Define the matrices (a) Identity matrix (b) Scalar matrix (c) Diagonal matrix. 03
- (b) Find the coordinates of the point which divides the line segment joining the points (6,3) and (4,-5) in the ratio 3:2 (i) internally and (ii) externally 04
- (c) (i) If $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$ then find the value of x . 07
(ii) If the angle between two lines is $\frac{\pi}{4}$ and slope of one of the lines is $\frac{1}{4}$, find the slope of the other line.
- OR
- Q.3** (a) State the Quotient (division) rule of derivative and compute the derivative of $f(x) = \frac{\sin x}{\cos x}$ 03
- (b) A quadrilateral has the vertices at the points (-4, 2), (2, 6), (8, 5) and (9, -7). Show that the mid points of the sides of this quadrilateral are the vertices of a parallelogram. 04
- (c) (i) Find the angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$ 07
(ii) Solve the following system of linear equations by matrix method
 $x + y + 2z = 8, -x - 2y + 3z = 1, 3x - 7y + 4z = 10$

- Q.4 (a)** Determine the order of the following differential equations **03**
- (i) $\left(\frac{d^3y}{dx^3}\right)^3 + 5\left(\frac{d^2y}{dx^2}\right)^4 + 2y = 0$ (ii) $\left(\frac{d^4y}{dx^4}\right)^4 + \left(\frac{d^2y}{dx^2}\right) + \sin y = 0$ (iii) $(y'')^2 + 3(y')^5 - y = 0$
- (b)** If $y = (\cos x)^{\log x}$ then find $\frac{dy}{dx}$ **04**
- (c)** Solve the differential equation by method of separation variables of **07**
- $$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x + y)u$$
- OR
- Q.4 (a)** Test the function for continuity at $x = 0$, Where **03**
- $$f(x) = x \sin \frac{1}{x}, x \neq 0$$
- $$f(x) = 0, x = 0$$
- (b)** Find the $\frac{dy}{dx}$ of the following function $y = \frac{1 + \cos x}{\sin x}$ **04**
- (c)** Solve the differential equation by method of separation variables of $\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y}$, given **07**
that $u(0, y) = 8e^{-3y}$
- Q.5 (a)** Evaluate $\int x^4 \tan x^5 dx$ **03**
- (b)** Evaluate by partial fractions $\int \frac{x+4}{3+2x-x^2} dx$ **04**
- (c)** **07**
- Show that the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$
- satisfies the equation $A^3 - 6A^2 + 9A - 4I = 0$. Hence find A^{-1}
- OR
- Q.5 (a)** Evaluate $\int \frac{\sin x}{\sin(x-a)} dx$ **03**
- (b)** Evaluate by partial fractions $\int \frac{x}{(2x+1)(x^2+1)} dx$ **04**
- (c)** **07**
- Find the inverse of the matrix $A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$
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