

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-I & II EXAMINATION – WINTER 2024

Subject Code: BE01000171

Date:16-01-2025

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)** Find the equation of line and slope the points (-1,1) and (2,-4). **03**
- (b)** Find the limits: $\lim_{x \rightarrow 1} \frac{x^3 - x^2 + 5x + 6}{x^2 - 5x + 6}$ **04**
- (c)** (i) Find $\frac{dy}{dx}$ if $x = 2\cos t - \cos 2t$ and $y = 2\sin t - \sin 2t$ **03**
- (ii) Find $A \cdot B$ if $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 5 \\ 1 & -6 & 2 \end{bmatrix}$ **04**
- Q.2 (a)** Derive the trigonometry identity: $\sin 3x = 3\sin x - 4\sin^3 x$ **03**
- (b)** Find the Inverse of Matrix $A = \begin{bmatrix} 4 & -2 & 1 \\ 5 & 0 & 3 \\ -1 & 2 & 6 \end{bmatrix}$ **04**
- (c)** Solve the system of linear equations **07**
 $2x - 3y + 5z = 11, 3x + 2y - 4z = -5, x + y - 2z = -3$
- OR**
- (c)** (i) Define (a) Exponential function (b) Modulus function (c) Domain of function. **03**
- (ii) Find the distance of the point (-3, 5) from the line $4x - 3y - 26 = 0$. **04**
- Q.3 (a)** State the multiplication rule of derivative and compute the derivative of **03**
 $f(x) = (x^2 + 2x + 3)(\tan x)$
- (b)** Find the angle between the lines $x + 2y - 5 = 0$ and $3y - x + 6 = 0$ **04**
- (c)** **03**
- (i) Find the determinant of $A = \begin{bmatrix} 1 & -2 & 0 \\ 2 & -4 & 5 \\ 3 & 7 & 4 \end{bmatrix}$ **04**
- (ii) Verify $(AB)^T = B^T A^T$ for $A = \begin{bmatrix} 1 & 5 \\ 2 & 0 \end{bmatrix}, B = \begin{bmatrix} 2 & 0 \\ 1 & 4 \end{bmatrix}$ **04**
- OR**
- Q.3 (a)** Define (a) Symmetric Matrix (b) Skew symmetric matrix (c) Null Matrix **03**
- (b)** If $y = \log(\sin x)$ then prove that $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 + 1 = 0$ **04**
- (c)** (i) If $y = \log(\sin x^2)$ then find $\frac{dy}{dx}$ **03**

- (ii) If $f(x) = \log x$ prove that (i) $f(xy) = f(x) + f(y)$ (ii) $f\left(\frac{x}{y}\right) = f(x) - f(y)$ **04**
Q.4 (a) Determine the order and degree of the following differential equations **03**

(i) $\frac{d^4y}{dx^4} + \left(\frac{d^2y}{dx^2}\right) - 3\frac{dy}{dx} + y = 9$ (ii) $\left(\frac{d^2y}{dx^2}\right)^4 + \frac{dy}{dx} = 3$

(iii) $\frac{d^3y}{dx^3} + 3x\frac{dy}{dx} = e^y$

- (b) Solve the differential equations $(x - xy^2)dx = (y - x^2y)dy$ **04**

- (c) Solve the following equations: **03**

(i) Solve $\frac{dy}{dx} + y \tan x = \sin 2x$

(ii) Solve $(2x - 3y)dx + (1 - 3x)dy = 0$ **04**

OR

- Q.4 (a)** Define (i) Differential equation (ii) Order (iii) Degree with example. **03**

- (b) Find the solution of $\frac{dy}{dx} = \frac{1}{e^{2y} + x}$ **04**

- (c) Solve the following equations:

(i) Solve $y' = e^{2x+3y}$ **03**

(ii) solve $\frac{dy}{dx} = \frac{x-y}{x+y}$ **04**

- Q.5 (a)** Find the integrals $\int \frac{(1-3x)^2}{x^3} dx$ **03**

- (b) Evaluate the integrals: (i) $\int x \log x dx$ (ii) $\int_0^{\frac{\pi}{4}} \cos^2 x dx$ **04**

- (c) $\int \frac{x^2}{(x^2-1)(x^2-3)} dx$ **07**

OR

- Q.5 (a)** Find the integrals $\int_0^1 \frac{4x^3-5x+3}{\sqrt{x}} dx$ **03**

- (b) Find $\int_0^{\frac{\pi}{3}} \frac{\sin x}{3+4\cos x} dx$ **04**

- (c) Find $\int_3^8 \frac{x}{(x-1)(x-2)} dx$ **07**

* * *