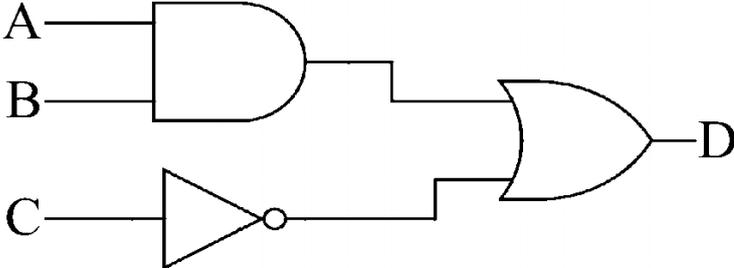# GUJARAT TECHNOLOGICAL UNIVERSITY
B.VOC- SEMESTER–I EXAMINATION – SUMMER 2025

Subject Code:1110701   **Date:21-05-2025**
Subject Name: Basic Mathematics
Time:02:30 PM TO 04:30 PM   **Total Marks:50**
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 Dot product $\vec{V_1} \cdot \vec{V_2}$ where vectors $\vec{V_1}$ and $\vec{V_2}$ are
		    i. $\vec{V_1} = 3\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ and $\vec{V_2} = \hat{\imath} + 3\hat{\jmath} + 3\hat{k}$
		    ii. $\vec{V_1} = \hat{\imath} - 2\hat{\jmath} + \hat{k}$ and $\vec{V_2} = \hat{4\imath} + \hat{\jmath} + \hat{k}$
			05

(b) If possible find a matrix multiplication AB, of matrix   **05**
$$A = \begin{bmatrix} 4 & 0 \\ -1 & 5 \\ 3 & -2 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & -2 & 3 \\ -5 & 1 & -4 \end{bmatrix}.$$

Q.2 **(a)** Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 1 & 5 & 7 \end{bmatrix}$.   **05**

(b) Find the complex conjugate and modulus of $\dfrac{(2+i)(1-2i)}{3-i}$.   **05**

OR

(b) Find the roots of the equation $x^2 + 2x + 2 = 0$.   **05**

Q.3 **(a)** Show that the minimization of   **05**
$F_1 = \bar{x} \cdot \bar{y} \cdot z + \bar{x} \cdot y \cdot z + x \cdot y \cdot \bar{z} + x \cdot y \cdot z$ is
$F_2 = x \cdot y + \bar{x} \cdot z + y \cdot z$.

(b) What are logic gates? Explain NOT gate, AND gate and NAND gate   **05**
with their block diagram symbol and the truth table.

OR

Q.3 **(a)** Find the Boolean expression of the given logic circuit.   **05**

(b) State and prove De-Morgan's Law.   **05**

Q.4 **(a)** Find $\frac{d}{dx}(e^x \sin x)$.   **05**

(b) Find $\int(x^3 - 3x^2 + x + 1)dx$ **05**

OR

Q.4 **(a)** Find $\frac{d}{dx}\left(\frac{\sin x}{x}\right)$.   **05**

(b) Find $\int x \cdot e^x \, dx$ **05**

Q.5 **(a)** Form a differential equation from $y = c_1 \sin x + c_2 \cos x$.   **05**

(b) Solve $\dfrac{dy}{dx} = \dfrac{y}{x+2}$.   **05**

<div align="center">

OR

</div>

Q.5 **(a)** Find the order and degree of the following differential equations.   **05**

i. $\dfrac{d^2y}{dx^2} - \left(\dfrac{dy}{dx}\right)^{\frac{1}{3}} = 0$

ii. $\left(\dfrac{d^3y}{dx^3}\right)^2 + \dfrac{d^2y}{dx^2} + \dfrac{dy}{dx} + y = 0$

(b) Solve $\dfrac{dy}{dx} + \dfrac{y}{x} = x$.   **05**

<div align="center">

****

</div>