Enrolment No/Seat No.: _____

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT

(An Autonomous Institute U/s UGC Act 1956)

B.Voc. SEMESTER-I, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1SH113 **DATE: 15-12-2025**

SUBJECT NAME: MATHEMATICS

TIME: 11:00 AM to 01:00 PM **TOTAL MARKS: 50**

Instructions

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Attempt all questions in the question paper.
3. The figures to the right of each question indicate full marks. Make suitable assumptions with proper justification wherever required.
4. Simple, non-programmable scientific calculators are permitted.
5. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

			Marks	BL	CO
Q.1	**(a)**	Fit a straight line to the following data:	**05**	**A**	**1**

x	-1	0	1	2
y	1	0	1	4

	(b)	Fit a curve of the form $y = ab^x$ to the following data:	**05**	**A**	**1**

x	1	2	3	4	5	6	7
y	87	97	113	129	202	195	193

Q.2	**(a)**	Find the value of determinant $\begin{vmatrix} 2 & 1 & -2 \\ 2 & 1 & -3 \\ 5 & 4 & -9 \end{vmatrix}$.	**05**	**A**	**2**
	(b)	Find inverse of the matrix $\begin{bmatrix} 2 & 1 & -4 \\ -3 & 0 & 1 \\ 1 & 1 & 2 \end{bmatrix}$.	**05**	**A**	**2**

OR

Q.2	**(a)**	If $A = \begin{bmatrix} 2 & 1 & 3 \\ 3 & 0 & 1 \\ 3 & 2 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 2 \\ 2 & -1 & 1 \\ 1 & 3 & 2 \end{bmatrix}$ then find $A + B$ and $A - B$.	**05**	**A**	**2**
	(b)	Solve the system of equation $x + 2y - z = 3$, $3x - y + 2z = 1$, $2x - 2y + 3z = 2$	**05**	**A**	**2**

Q.3	**(a)**	Use Newton's forward difference method to find the approximate value of $f(1.3)$ from the following data:	**05**	**A**	**3**

x	1	2	3	4
$f(x)$	1.1	4.2	9.3	16.4

	(b)	Consider the following tabular values:	**05**	**A**	**3**

x	50	100	150	200	250

$f(x)$	618	724	805	906	1032

Determine $y(300)$ using Newton's backward interpolation formula.

OR

Q.3 **(a)** Construct Newton's forward interpolation polynomial for the following data: **05** **A** **3**

x	4	6	8	10
y	1	3	8	16

(b) By using Lagrange's interpolation formula, find the value of y when $x = 10$ from the following table: **05** **A** **3**

x	5	6	9	11
y	12	13	14	16

Q.4 **(a)** Find the derivative of the following: **05** **A** **4**

i) $f(x) = x^2 - 4x + 11$

ii) $f(x) = e^x \sin x$

(b) Find the integration of the following: **05** **A** **4**

i) $f(x) = x^4 - 4x^3 + x^2 + 2x - 8$

ii) $f(x) = \frac{1}{x} + e^{2x} + \cos x$

OR

Q.4 **(a)** Find the derivative of the following: **05** **A** **4**

i) $f(x) = x^4 - 2x^2 + 4x + 11$

ii) $f(x) = \frac{\sin x}{x}$

(b) Find the integration of the following: **05** **A** **4**

i) $f(x) = x^2 - 4x + 11$

ii) $f(x) = e^x - \sin x$

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

i. $\frac{dy}{dx} + xy = x^2$

ii. $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3 + y = \cos x$

iii. $\frac{d^3y}{dx^3} + \left(\frac{d^2y}{dx^2}\right)^3 + \frac{d^4y}{dx^4} + y = \log x$

(b) Solve $(x + 2)dy = ydx$ by using the method of separable of variable. **05** **A** **5**

OR

Q.5 **(a)** Form differential equation corresponding to the following equations: **05** **A** **5**

i. $y = ae^x$

ii. $y = a \sin x + b \cos x$

(b) Solve $\frac{dy}{dx} + y = e^{-x}$ **05** **A** **5**

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