Enrolment No/Seat No.: _____

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

(An Autonomous College U/s UGC Act 1956)

B. Voc. SEMESTER-I, SEMESTER END EXAMINATION - WINTER 2024

Subject Code: 1SH113 **Date: 10-12-2024**

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 - Bloom's Taxonomy Levels (R-Remember, U-Understanding, A-Application, N-Analyze, E-Evaluate, C-Create), CO - Course Outcomes.

		Marks	BL	CO
Q.1	**Objective-Type Questions**	**[05]**		
(a)	Which of the following is the general form of straight line?	**1**	**R**	**1**
	(i) $y = a + bx$ **(ii)** $y = a + bx + cx^2$			
	(iii) $y = ae^{bx}$ **(iv)** $y = ax^b$			
(b)	If $A = \begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 1 \\ -2 & -1 \end{bmatrix}$ then $A + B$ =?	**1**	**A**	**2**
	(i) $\begin{bmatrix} 2 & -2 \\ 0 & 0 \end{bmatrix}$ **(ii)** $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$			
	(iii) $\begin{bmatrix} 0 & 0 \\ 4 & 2 \end{bmatrix}$ **(iv)** $\begin{bmatrix} 0 & -1 \\ 2 & 1 \end{bmatrix}$			
(c)	$\Delta f(x)$ =?	**1**	**R**	**3**
	(i) $f(x+h) - f(x-h)$ **(ii)** $f(x+h) - f(x)$			
	(iii) $f(x) - f(x-h)$ **(iv)** $f(x) + f(x-h)$			
(d)	Which of the following represent integration of $\sin x$?	**1**	**R**	**4**
	(i) $\int \sin x\, dx = \cos x + c$ **(ii)** $\int \sin x\, dx = -\cos x + c$			
	(iii) $\int \sin x\, dx = \sec x + c$ **(iv)** $\int \sin x\, dx = \operatorname{cosec} x + c$			
(e)	What is the general form of a first-order ordinary differential equation?	**1**	**R**	**5**
	(i) $\frac{dy}{dx} + Py = Q$ **(ii)** $\frac{d^2y}{dx^2} + Py = Q$			
	(iii) $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$ **(iv)** none of the above			

Q.2 Attempt Any Three **[15]**

(a) Fit the straight line $y = a + bx$ to the following data **5 A 1**

x	1	2	3	4	5
y	2	4	5	4	5

(b) Fit the law of the form $y = ax^b$ to the following data **5 A 1**

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

(c) Find determinant of the following **5 A 2**

i. $\begin{vmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 1 & 6 & 7 \end{vmatrix}$ ii. $\begin{vmatrix} 1 & 0 & -1 \\ 3 & 5 & 2 \\ 2 & 0 & -2 \end{vmatrix}$

(d) Let $A = \begin{bmatrix} -2 & 5 & 4 \\ 5 & 7 & 5 \\ 4 & 5 & -2 \end{bmatrix}$ and B= $\begin{bmatrix} -2 & 5 & 4 \\ 5 & 7 & 5 \\ 4 & 5 & -2 \end{bmatrix}$ **5 A 2**

Find $A + B, A - B$ and AB.

Q.3 Attempt Any Three **[15]**

(a) Construct a forward and backward difference table for the following data: **5 A 3**

x	1	2	3	7
y	24	114	320	715

(b) Using Newton's forward interpolation formula find polynomial of degree 3 from the following data: **5 A 3**

x	1	3	5	7
y	24	120	336	720

(c) Using Lagrange's interpolation formula, find the form of the function $y(x)$ from the following data: **5 A 3**

x	1	2	3
y	2	3	5

(d) Find derivative of the following: **5 A 4**

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

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

Q.4 Attempt Any Three **[15]**

(a) Find the value of integration $\int x\, e^x dx$. **5 A 4**

(b) Form Differential equation corresponding to the equation **5 A 5**

$$y = c_1 e^x + c_2 e^{-x}$$

(c) Find Order and Degree of the following Differential equations: **5 U,A 5**

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

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

(d) Solve the following differential equation: **5 A 5**

i. $\frac{dy}{dx} = \frac{y-4}{x}$

ii. $\frac{dy}{dx} - \frac{2y}{x} = 3x^2$

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