BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc **SEMESTER : IV**
BRANCH: CHEMISTRY **SESSION : SP/2025**

SUBJECT: MA207R1 MATHEMATICS IV

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Write the name of the following form of ODE and find the general solution of $x^2y'' - 3xy' + 10y = 0.$	[5]	1	
Q.1(b)	Discuss order, degree, homogeneity of the following ODE and solve $(D^2 - 4D + 3)y = e^x - \frac{9}{2}x.$	[5]	1	
Q.2	Use Frobenius method about $x = 0$ to solve $x^2y'' + xy' + (x^2 - 4)y = 0.$	[10]	2	
Q.3(a)	Solve the PDE $yz\,p + zxq = xy,$ where $p = \frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$.	[5]	3	
Q.3(b)	The temperature distribution in a bar of length π, which is perfectly insulated at the ends $x = 0$ and $x = \pi$ is governed by the partial differential equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ Assuming the initial temperature as $u(x, 0) = cos\,2x$, find the temperature distribution at any instant of time.	[5]	3	
Q.4(a)	Let $f(z) = Re(z^2) - i\,Im(z^2)$. Verify whether the function $f(z)$ is analytic or not.	[5]	4	
Q.4(b)	Show whether Cauchy integral theorem can be applied to evaluate $\oint_C \frac{1}{\pi z - 1} dz$, where C is the unit circle $\|z\| = 1$. Further find the value of the integral.	[5]	4	
Q.5(a)	Let $f(z) = \frac{z}{(z-1)(5-z)}$. Expand $f(z)$ about $z = 1$ and $z = 5$ in a Laurent series for $1 < \|z\| < 2$.	[5]	5	
Q.5(b)	Use Cauchy Residual theorem to find $\oint_C \frac{1}{z^3 - z^4} dz$, where C: $\|z\| = \frac{1}{2}$.	[5]	5	

::::::29/04/2025::::::M