BIRLA INSTITUTE OF TECHNOLOGY MESRA, RANCHI
DEPARTMENT OF MATHEMATICS
END SEMESTER EXAMIMATION

Class: MSc/ PhD
Course: MA423 Numerical Methods **Session: SP/2022**
Time : 2 hours **Maximum Marks : 50**

1(a)	Derive the Newton-Raphson method formula to find reciprocal and to find nth root. When does the method fail? Solve the following by the Newton-Raphson method $3x = \cos x+1$	5m
1(b)	Solve $x^3+x-1=0$ by iterative method, take initial approx. as $x_0 = 1.0$.	5m
2(a)	Solve the following system by the Gaussian – Elimination method $2x - 7y + 4z = 9; x + 9y - 6z = 1; -3x + 8y + 5z = 6$	5m
2(b)	Compare the of Gauss Jacobi and Gauss seidel methods and hence solve the following by Gauss seidel Method **or** Jacobi method $x + y + 54z = 110,$ $27x + 6y - z = 85,$ $6x + 15y + 2z = 72$	5m
3(a)	Find all the eigenvalues and eigenvectors of the matrix using the Jacobi Method **or** Givens method $\begin{bmatrix} 2 & 3 & 1 \\ 3 & 2 & 2 \\ 1 & 2 & 1 \end{bmatrix}$.	5m
3(b)	Find the largest eigenvalue in modulus and the corresponding eigenvector of the matrix using power method $\begin{bmatrix} -15 & 4 & 3 \\ 10 & -12 & 6 \\ 20 & -4 & 2 \end{bmatrix}$.	5m
4(a)	Evaluate $\int_0^1 \frac{dx}{(1+x^2)}$),using trapezoidal rule or Simpsons 3/8 rule. How to find the error in Trapezoidal and Simpson's 1/3 method? Briefly explain.	5m
4(b)	Using table find y (10) using Newton's divided differences and Lagrange interpolation	5m

X	8	9	9.5	11
Y	2.709442	2.197225	2.251292	397895

5(a)	Solve the Following Boundary value problem $y'' + 2xy' + 2y = 5x$, h=0.1, y(0)=1, y(0.5)=1.5 by difference method. (Any other data required may be assumed)	5m
5(b)	If $\frac{dy}{dx} = x^2 + y^2$; $y(0) = 1$ Find y(0.1) and y(0.2) by Euler Method **or** Runge-Kutta fourth order method.	5m

-------04/05/2022 E------