School of Basic Sciences

Back Paper Examination Even Semester (Non - Graduating Batches) – June 2024

[Programme: B.Tech] [Semester:] [Batch:]

Course Title: Numerical Methods	Max Marks: 100
Course Code: MATH3010	Time: 3 Hrs.

Instructions:	*1. All questions are compulsory.*
	2. Assume missing data suitably, if any.

		K Level	COs	Marks
	SECTION-A (15 Marks) 5 Marks each			
1.	If $u = \dfrac{4x^2 y^3}{z^4}$ and errors in x, y, z be 0.001, compute the maximum absolute, relative, percentage error in u, when $x = 1, y = 1, z = 1$			5
2.	Find a root of the equation $\cos x = x e^x$ by Bisection method. Perform four iterations.			5
3.	Using Euler's method, find an approximate value of y corresponding to x=2, given that $\dfrac{dy}{dx} = x + 2y$ and $y(1) = 1.$			5
	SECTION-B (40 Marks) 10 Marks each			
4.	Find a root of $x^3 - x^2 - 1 = 0$ using the Newton-Raphson method correct to three decimal places.			10
5.	Construct the forward difference table for $f(x) = x^3 - 2x^2 + 4x + 5$ for x= 1,3,5,7. Also find $\Delta^2 f(3)$.			10
6.	A train is moving at the speed of 30m/s suddenly the brakes are applied. The speed of the train per second after t seconds is given by (Time t): 0 5 10 15 20 25 30 35 40 45 (speed v) :30 24 19 16 13 11 10 8 7 5 Apply Simpson 3/8 Rule to determine the distance covered by the train in 45 seconds			10
7.	Solve the equation $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}$ subject to the conditions u $(x, 0) = \sin\pi x$, 0< x < 1, ; $u(0, t) = u(1, t) = 0, \ t \geq 0.$ Find u for x=0.6 at t =.04.			10
	SECTION-C (45 Marks) 15 Marks each			
8.	Solve the following system of linear equations by Gauss Jordan method: $\begin{bmatrix} 2 & 3 & -1 \\ 4 & 4 & -3 \\ -2 & 3 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \\ 1 \end{bmatrix}$.			15
9.	Find the cubic Lagrange's interpolating polynomial from the following data: x: 0 1 2 5 f(x): 2 3 12 147. And, hence, find the value of f(3).			15

10	Write Trapezoidal formula for numerical integration, also evaluate $I = \int_4^{52} \log x\, dx$ $I = \int_4^{5.2} \log x\, dx$ by Trapezoidal rule (taking h=0.2).				15