



আন্তর্জাতিক ইসলামী বিশ্ববিদ্যালয় চট্টগ্রাম
International Islamic University Chittagong
Faculty of Science and Engineering (FSE)
Department of Civil Engineering (CE)

END-OF-SEMESTER EXAMINATION
SEMESTER AUTUMN-2022 SESSION

Programme	: Bachelor of Science in Civil Engineering	Level of Study	: Example: UG 2
Time	: 1:30~4:00pm	Date	: December, 2022 Sunday
Duration	: 2 hour 30 Minutes		
Course Code	: CSE-2303	Section(s)	: 3AM/4AM
Course Title	: Computer Programming & Numerical Methods in Civil Engineering		

This Question Paper Consists of **THREE (3)** Printed Pages (Including Cover Page) with **FIVE (5)** Questions.

Course Learning Outcome(CLO)	
CLO-1	Analyze the numerical problems using the different solution technique.
CLO-2	Demonstrate an understanding of basic programming in Fortran, programming style, variables and data types.
CLO-3	Get insight on the fundamental concepts in developing the algorithm for various computer codes.
CLO-4	Analyze the problems using the different programme

Bloom's Levels of the Questions						
Letter Symbol	R	U	A	ANA	E	C
	Remember (10)	Understand (10)	Apply (10)	Analysis (30)	Evaluation (30)	Create (10)

INSTRUCTION(S) TO CANDIDATES

DO NOT OPEN UNTIL YOU ARE ASKED TO DO SO

- This is a Closed Book, Closed Notes Examination.
- Do not open until You Are Asked to Do So.
- Total mark of this examination is 100 for two sections A & B and is worth 50% of the total course.
- Attempt All Questions.
- Mobile Phones and Other Electronic Devices are Prohibited in the Exam Hall.
- **Workout Can Be Done Using Pencil Or Pen.**

Note: Any form of cheating or attempt to cheat is a serious offence, which may lead to dismissal

PART –A

(There are THREE questions, answer all THREE Questions)

QUESTION 1 (20 marks)		
a)	What do you mean by <i>numerical computing</i> ? What are the major areas of numerical computing methods?	(4 marks)
b)	Find the root of the equation $x^3 - 9x + 1 = 0$, correct to two decimal places, by using the <i>bisection method</i> . OR Find the root of the equation $x^3 - 6x + 4 = 0$, correct to two decimal places, by using the <i>Newton-Raphson method</i>	(16 marks)

QUESTION 2 (10 marks)		
a)	Write down the flowchart of the engineering problem solving process.	(4 marks)
b)	Solve the following system of linear equations with Gauss Elimination Method. $\begin{bmatrix} 8 & 2 & -2 \\ 10 & 2 & 4 \\ 12 & 2 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ 4 \\ 6 \end{bmatrix}$ OR Solve the following system of linear equations by using <i>Gauss Seidel method</i> . $\begin{aligned} 2x + y + z &= 7 \\ x - y + z &= 0 \\ 4x + 2y - 3z &= 4 \end{aligned}$	(16 marks)

QUESTION 3(10 marks)								
a)	What do you mean by <i>interpolation</i> ?							(4 marks)
b)	Using <i>Newton's forward interpolation formula</i> , find the population of a town in 1974, with the help of the following data							(16 marks)
	year	1961	1971	1981	1991	2001	2011	2021
	population	24	36	45	57	65	78	89
		(in millions)						

PART –B

(There are TWO questions, answer all TWO Questions)

QUESTION 4 (10 marks)

The following data defined the sea-level concentration of dissolved oxygen for fresh water as a function of temperature. Estimate O(27) using Newton's interpolating polynomial. Note that the exact result is 7.986 mg/L.

T(Celsius)	0	8	16	24	32	40
O, mg/L	14.621	11.843	9.870	8.418	7.305	6.413

Or

Use least-squares regression to fit a straight line to the following observations.

x	1	2	3	4	5	6	7	8	9
y	1	1.5	2	3	4	5	8	10	13

Along with the slope and intercept, compute the standard error of the estimate and the correlation coefficient. Plot the data and the straight line. Assess the fit.

(20 marks)

QUESTION 5 (10 marks)

a) Derive the Trapezoidal rule for numerical integration.

b)

A river is 80 unit wide. The depth d at a distance x unit from one bank is given by the following table

x	0	10	20	30	40	50	60	70	80
d	0	4	7	9	12	15	14	8	3

Find the area of cross-section of the river using Simpson's 1/3 rule.

OR

Solve the following initial value problem from t=0 to 2 with h=0.5 using Euler's method.

$\frac{dy}{dx} = y \sin^3(t)$, y(0)=1

(8 marks)

(12 marks)

End of Questions Paper