DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
UNIVERSITY OF BARISHAL
FINAL EXAMINATION
Course Title: Numerical Methods
Course Code: CSE-3107
3rd Year 1st Semester
Session: 2020-21
(Answer Any Five Questions)

Time: 3 Hours Marks: 60

1 a) Discuss the significance of studying numerical methods and outline the advantages and disadvantages of finding root(s) of equations using iterative methods. [6]

b) Find a real root of the equation $X^3 - 2X^2 - 4 = 0$ by using Bisection Method and False position methods with code with initial values 2 and 3. [6]

2 a) Show that the n^{th} difference of n^{th} degree polynomial is constant. [4]

b) What do you mean by operator? Establish the relation between the following various operators [4]
   i. $\Delta - \nabla \equiv \Delta\nabla$
   ii. $(1 + \Delta)(1 - \nabla) \equiv 1$

c) Show that the second forward difference of the quadratic polynomial f(x) = ax^2 + bx + c is constant. [4]

3 a) Consider the following table, which contains the data on the number of students (approx.) applying from 2012 to 2019. Additionally, the value for 2016 is also missing. Now your task is to find the approximate value for the year. [6]

x	2012	2013	2014	2015	2016	2017
f(x)	17.1	13	14	9.6	-----	12.4

b) Find the missing term in the following table [6]

x	10	15	20	25	30	35
f(x)	43	-----	29	32	-----	77

4 a) Briefly describe Newton-Gregory's formula for forward and backward interpolation with equal intervals. [8]

b) For the following table, find the value of f(29) along with the name of interpolation formula with justification. [4]

x	20	22	24	26	28	30
$f(x)$	165	166	168	169	170	171

5 a) Derive Lagrange's Interpolation formula for unequal intervals. [6]

b) Find the cubic polynomial which takes the following values [6] $y(0) = 1,\ y(1) = 3,\ y(3) = 31,\ y(6) = 223,\ and\ y(10) = 1011$ then find y(2.5) using Lagrange's interpolation formula.

6 a) Derive the general quadrature formula for numerical integration of $\int_a^b f(x)dx$ using the Newton's forward interpolation formula. [6]

b) Deduce the General Quadrature formula for the numerical integration using equidistance ordinates and hence establish Simpson's ⅓ and ⅜ rule. [6]

7 a) Solve the system of linear equations by matrix inversion method [6]

$$3X + Y + 2Z = 3, \qquad 2X - 3Y - Z = -3, \qquad X + 2Y + Z = 4$$

b) Solve the following system of linear equations by Gauss-Jordan method [6]

$$X - Y + 6Z = 41, \qquad 3X + 2Y - Z = 20, \qquad 2X + 3Y - 3Z = 7$$

8 a) Find the first, second, and third derivatives of the function tabulated below, at the point x=1.0 [6]

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.000	1.625	24.000	38.875	59.000

b) Evaluate $\int_0^1 \frac{dx}{1+x}$ by using Simpson's ⅓ rule and simpson ⅜ rule. [6]