



UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 5th Semester Examination, 2020

CC12-MATHEMATICS
NUMERICAL METHODS

Full Marks: 40

ASSIGNMENT

*The figures in the margin indicate full marks.
All symbols are of usual significance.*

Answer all questions

GROUP-A

1. Answer **all** the following questions: 2×5 = 10
 - (a) If $u(x, y, z) = xyz^2$ and errors in x, y, z are 0.005, 0.001 and 0.002 respectively at $x = 3, y = 1, z = 1$. Compute the maximum absolute error in evaluating u at (3, 1, 1). 2
 - (b) Show that the following rearrangement of equation $x^3 + 6x^2 + 10x - 20 = 0$ does not yield a convergent sequence of successive approximations by iteration method near $x = 1$, 2

$$x = (20 - 6x^2 - x^3)/10$$
 - (c) Show that error in $(m + 1)$ in iteration tends to zero as $m \rightarrow \infty$ in Bisection method. 2
 - (d) In the solution of the system $AX = B$ by Gauss Elimination method, if ΔB be the error in the solution, then how you justify that ΔB will be minimised by partial pivoting? 2
 - (e) How justify that the equation $\tan x + x = 0$ has exactly one root in $[2, 2.5]$? 2

GROUP-B

2. Answer **all** the following questions: 5×6 = 30
 - (a) If α, β be the roots of $x^2 + ax + b = 0$, show that the iteration $x_{n+1} = \frac{-b}{(x_n + a)}$ will converge near $x = \alpha$ if $|\alpha| < |\beta|$. 5

- (b) Use Gauss Elimination method to solve the following system of equations, 5

$$-10x_1 + 6x_2 + 3x_3 + 100 = 0$$

$$6x_1 - 5x_2 + 5x_3 + 100 = 0$$

$$3x_1 + 6x_2 - 10x_3 + 100 = 0$$

- (c) Write a program in C to solve the following equation by bisection method, correct upto 5 decimal places: 5

$$10\log_{10}x - x^2 + 3 = 0$$

[Attach the copy of 'Run-Sheet']

- (d) Apply Gauss-Seidel iteration method to solve the system: 5

$$9.37x_1 + 3.04x_2 - 2.44x_3 = 9.23$$

$$3.04x_1 + 6.18x_2 + 1.22x_3 = 8.20$$

$$-2.44x_1 + 1.22x_2 + 8.44x_3 = 3.93$$

- (e) (i) Find the cube root of 10 upto 4 significant figures by Newton-Raphson method. 3+2

(ii) Write the flow-chart of Regula-Falsi method.

- (f) Write a program in 'C' to solve following system of equations by Gauss-Jacobi iterative method, correct to 5 significant figures: 5

$$0.89x_1 + 4.32x_2 - 0.47x_3 + 0.95x_4 = 3.36$$

$$1.13x_1 - 0.89x_2 + 0.61x_3 + 5.63x_4 = 4.27$$

$$6.32x_1 - 0.73x_2 - 0.65x_3 + 1.06x_4 = 2.95$$

$$0.74x_1 + 1.01x_2 + 5.28x_3 - 0.88x_4 = 1.97$$

[Attach the copy of 'Run-Sheet']

—x—