Bangabandhu Sheikh Mujibur Rahman Science & Technology University, Gopalganj.
Department of Computer Science and Engineering
2nd Year 2nd Semester B. Sc. Engineering Examination-2013
Course No. : MAT256, **Course Title:** Numerical Methods

Full Marks: 70 **Time:** 3 hours

N.B.: Instruction for Candidates:

i) The figures in the right margin indicate full marks.
ii) Answer any **SIX** questions, taking any **THREE** from each section.
iii) Use separate answer script for each section.

SECTION-A

01. a) Define errors, Round off errors, Relative errors and Absolute errors in numerical analysis. **3.67**

b) Derive Newton-Raphson method to find an approximate root of an equation $f(x)=0$. **04**

c) Find a real root of the equation $x^3+x-1=0$ by using bisection method, correct up to four decimal places. **04**

02. a) What is diagonally dominant and strictly diagonally dominant? **1.67**

b) Discuss Gaussian Elimination method for solving the system of n linear equations. **05**

c) Solve the following system **05**

$2x_1+x_2+x_3=10$

$3x_1+2x_2+3x_3=18$

$x_1+4x_2+9x_3=16$

by using Gauss Elimination method.

03. a) By the least square method derive the equation of straight line which best fits the curve. **04**

b) Fit a second degree parabola to the following data: **04**

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

c) Solve the equation $e^x-3x=0$ by Newton Raphson method. **3.67**

04. a) Discuss the method of False position to find an approximate root of an equation $f(x)=0$. Also give the geometrical significance of the method of False position. **07**

b) Solve the following system of linear equations by using Gauss-Seidal method up to six iteration: $83x+11y-4z=95$, $7x+52y+13z=104$ and $3x+8y+29z=71$. **4.67**

SECTION-B

05. a) Derive Lagrange's interpolation formula for unequal interpolation. **04**

b) The following values of the function $f(x)$ for the values of x are given: $f(1)=4$, $f(2)=5$, $f(7)=5$, $f(8)=4$. Find the values of $f(6)$ and also the values of x for which $f(x)$ is maximum or minimum. **05**

c) By using Newton's divided difference formula, find the values of $f(15)$ from the following data table: **2.67**

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

06. a) Derive Simpson's one-third rule for the numerical integration. **06**

b) Evaluate the values of the integral $\int_{0.2}^{1.4}(\sin x - \ln x + e^x)dx$, by (a) Trapezoidal rule, (b) Simpson's one-third rule and (c) Simpson's three-eight rule, where choosing h=0.1. After finding the true values of the integral, compare the errors in all cases. **5.67**

07. a) Derive Euler's method for first order differential equation. **4**

b) Given the equation $\dot{y}(x) = {}^{2y}/_{x}$ with y(1)=2. Estimate y(2) using Euler's method by taking h=0.5. **3.67**

c) Given $\frac{dy}{dx} = y - x$, where $y(0)=2$. Find $y(0.1)$ and $y(0.2)$ correct to four decimal places using Runge- Kutta second order method. **4**

08. a) Derive the Runge- Kutta second order method for the solution of the first order ordinary differential equation **06**

b) Use the Runge- Kutta fourth order method to find the value of $y(0.1)$, $y(0.2)$ and $y(0.3)$. Given the differential equation $\frac{dy}{dx} = 1 + y^2$ with the initial condition $y(0)=0$ **5.67**