University of Rajshahi
Department of Computer Science and Engineering
B.Sc. (Engg.) Part-2, Even Semester Examination-2017
Course No.: MATH2231 (Numerical Methods)
Marks: 35 Time: 2:00 Hours

(Answer any four questions taking at least two from each Part)

Section-A

1. (a) What do you mean by numerical method? Distinguish between direct and numerical method. 3
   (b) Numerical method approaches are essential in modern science and engineering field, why? Explain. 2.75
   (c) Define numerical, algebraic and transcendental expressions with suitable example. 3

2. (a) Explain the geometrical interpretation of Newton-Raphson method. 3
   (b) Describe how can the convergence of root finding iteration method be accelerated. 3
   (c) Find a real root of the equation $x^3 - x^2 - 1 = 0$ correct to 3 decimal places by false position method. 2.75

3. (a) Define forward, backward, central differences and divided difference. 3
   (b) Derive Lagrange's interpolation for unequal distance data. 3
   (c) The following values of x and y are given. Find $y(0.543)$. 2.75

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7
y(x)	2.631	3.328	4.097	4.944	5.875	6.896	8.013

Section-B

4. (a) Define curve fitting. Explain the purpose of it. 1.75
   (b) Describe the least square curve fitting procedure for a straight line. 4
   (c) The exponential function $y = ae^{bx}$ is fitted to the data: 3

x	0	0.5	1.0	1.5	2.0	2.5
y	0.10	0.45	2.15	9.15	40.35	180.75

   Find the values of a and b.

5. (a) Describe the geometrical meaning of Trapezoidal rule. 2
   (b) Explain Gaussian Elimination method to solve linear system of equations. 4
   (c) Solve the following equations using Gauss-Seidel method 2.75

$$10x + 2y + z = 9$$
$$2x + 20y - 2z = -44$$
$$-2x + 3y + 10z = 22$$

6. (a) From the Taylor series for $y(x)$, find $y(0.1)$ correct to four decimal places if $y(x)$ satisfies $y' = x - y^2$ and $y(0) = 1$. 5

   (b) Determine the value of y using modified Euler's formula when $x = 0.1$ given that $y(0) = 1$ *and* $y' = x^2 + y$ *and* $h = 0.05$. 3.75

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. (Engg.) Part-II (Even Semester) Examination-2016
Course: MATH2231 (Numerical Methods)
Full Marks: 35 Time: 2 Hours

[N.B. Answer any Four questions taking Two from each Part.]

Part A

1. (a) What is numerical method? Write the reasons to study it. 2.75
   (b) Define inherent error, round-off error and truncation error. 2
   (c) How can you measure absolute, relative and percentage errors? 2
   (d) Define algebraic and transcendental expression with example. 2

2. (a) Describe the bisection method for finding root of equation $f(x) = 0$ with its merits and demerits. 3.5
   (b) Describe Secant method for finding root of equation $f(x) = 0$. 2.25
   (c) To obtain a root correct to three decimal places of equation $x^3 - x - 4 = 0$ using false position method 3

3. (a) What are forward differences? Briefly discuss the forward difference table. Determine the difference table for the values of y given in the following table: 3

x	3	4	5	6	7	8	9
y	2.7	6.4	12.5	21.6	34.3	51.2	72.9

   (b) Find the value of y(1) and y(2) derived from the above table using the difference table. 2.75

Part B

4. (a) Explain the purpose of curve fitting procedure. 1.75
   (b) Describe the least square curve fitting procedure for a straight line. 4
   (c) Find the values of a and b so that $Y = ae^{bx}$ fits the data given in the table: 3

x	1.0	1.2	1.4	1.6
y	40.170	73.196	133.372	243.02

5. (a) Classify System of Linear Equations and explain them based on graphical representation. 3.75
   (b) Solve the following set of simultaneous equations using the Gauss-elimination method: 5

$$2x - 4y + 6z = 5$$
$$x + 3y - 7z = 2$$
$$7x + 5y + 9z = 4$$

6. (a) Derive Euler's method and modified Euler's method for solution of ordinary differential equations. 5

   (b) Use Euler's method to solve the equation $\frac{dy}{dx} = x + y$, $y(0) = 0$. Choose $h = 0.2$ and compute $y(0.4)$ and $y(0.6)$. 3.75

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University of Rajshahi
Department of Computer Science and Engineering
B.Sc. (Engg.), Part-II, Even Semester, Examination 2015
Course No : MATH2231 (Numerical Methods)

Marks: 35 **Time: 2 Hours**

[Answer any Four (04) questions taking at least two from each Part.]

Part-A

1. (a) What is numerical method? Write the reasons to study it. 2
   (b) Why do occur numerical errors? Explain different types of errors. 3
   (c) How can you measure absolute, relative and percentage errors? 3
   (d) How numbers are rounded-off ? Write the rule. 0.75

2. (a) Describe Iterative method for finding root of an equation. Explain how can the convergence of root finding iteration method be accelerated. 5.75
   (b) Find a real root of the equation $x^3 - 2x - 5 = 0$ correct to 4 decimal places by false position method. 3

3. (a) Write the procedure of successive approximation method. 2
   (b) What is forward differences? Briefly discuss the forward difference table. 3
   (c) Determine the difference table for the values of y given in the following table. 3.75

x →	3	4	5	6	7	8	9
y →	2.7	6.4	12.5	21.6	34.3	51.2	72.9

Part-B

4. (a) Derive Langrange's interpolation formula for unequal distance. 4.75
   (b) Find the value of *tan(0.05)* from the following table. 4

x→	0.10	0.15	0.20	0.25	0.30
y→	0.1003	0.1511	0.2027	0.2553	0.3093

5. (a) Explain Gauss-Seidel method for solution of linear system. 4.75
   (b) Solve the following system using Gaussian Elimination method 4

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

6. (a) Derive Simpson's 1/3 rule for numerical integration. 4
   (b) Find the area bounded by the curve and the x-axis from x=7.47 to x=7.52 using Simpson's 1/3 rule form the following table. 4.75

x	7.47	7.48	7.49	7.50	7.51	7.52
f(x)	1.93	1.95	1.98	2.01	2.03	2.06

University of Rajshahi
Department of Computer Science and Engineering
B.Sc(Engg), Part-II Even Semester Examination 2014
Course: MATH 2231 (Numerical Methods)

Time: 2 Hours Marks: 35

(Answer any **FOUR** taking at least **TWO** from any part)

Part-A

1. (a) What do you mean by exact and approximate number? Give example. 2.75
   (b) How can you measure absolute, relative and percentage errors? 4
   (c) Round off the following numbers to four significant figures: 2
   i) 38.46235 ii) 0.70029 iii) 0.0022218 iv) 19.235101

2. (a) Describe False Position and Newton-Raphson method for finding root of an equation. 5.75
   (b) Find a real root of the equation $x^3 - x^2 - 1 = 0$ correct to 3 decimal places by false position 3
   method.

3. (a) Derive Netwon's forward difference interpolation formula for equal distance data. 4.75
   (b) The following values of x and y are given. Find y(0.543). 4

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7
y(x)	2.631	3.328	4.097	4.944	5.875	6.896	8.013

Part-B

4. (a) Describe the least square curve fitting procedure for a straight line. 4.75
   (b) Find the values of a_0 and a_1 so that $y = a_0 + a_1 x$ fits the data given in the table 4

x	1	2	3	4	6	8
y	2.4	3.1	3.5	4.2	5.0	6.0

5. (a) Is it possible to find solution of a system of linear equation with singular augmented matrix by Gaussian Elimination Method? Justify your answer. 4

   (b) Solve the following system by Gauss-Jordan Method. 4.75

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

6. (a) Derive Simpson's 3/8 rule for numerical integration. 5
   (b) Derive Trapezoidal rule. 2.2
   (c) From the Taylor series for y(x), find y(0.1) correct to five decimal places if y(x) satisfies 1.5
   $y' = x^2 y - 1$ and y(0)=1.

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg. Part-II Even Semester Examination 2013
Course No : MATH2231 (Numerical Methods)
Marks: 35 Time: 2 Hours

Answer any four questions taking two from each Part

Part-A

1. (a) Define inherent error, round-off error and truncation error. 3
   (b) How can you measure absolute, relative and percentage errors? 4
   (c) Define Numerical, Algebraic, and Transcendental expression with example. 1.75

2. (a) Define Bisection method. Find the real root of the equation $x^3-2x-5=0$, using bisection method. 5.75
   (b) Explain the advantages and disadvantages of bisection method. 3

3. (a) Describe how can the convergence of root finding iteration method be accelerated. 3.75
   (b) Using synthetic division, find the three roots of the following polynomial: $x^3 - x^2 - 10x - 8 = 0$. Use an initial estimate of $x_0 = 6$ for the first root. 5

Part-B

4. (a) Derive Lagrange's interpolation for unequal distance data. 3.75
   (b) Develop an interpolation polynomial for the following data using the finite difference approach. Estimate the f(x) for x = 2.7 5

5. (a) Classify System of Linear Equations and explain them based on graphical representation. 3.75
   (b) Solve the following set of simultaneous equations using the Gauss-Jordan method: 5

$$4x - 2y + 3z = 15.7$$
$$-2x + 4y - z = -14.1$$
$$3x + y - 3z = -4.2$$

6. (a) Derive Simpson's 3/8 rule for numerical integration. 5
   (b) From the Taylor series for $y(x)$, find $y(0.1)$ correct to five decimal places if $y(x)$ satisfies $y' = x^2y - 1$ and $y(0) = 1$. 2
   (c) What is the local error term in Trapezoidal formula and in Simpson's 1/3 rule? 1.75

x	1	2	3
f(x)	3	5	8

University of Rajshahi
Department of Computer Science and Engineering
B.Sc(Engg) 2nd year 2nd Semister, 2012
Even Semester

Course- MATH2231 (Numerical Methods)

Time: 3 Hours **Marks :35**

$8\frac{3}{4} \times 4 = 35$

(Answer **FOUR** questions taking any **TWO** from each group)

Part-A

1.(a) Define absolute and relative errors by giving suitable example. $1\frac{3}{4}$

(b) Show that the order of convergence of Newton-Raphson method is two. 4

(c) Find a positive real root of equation $x^3 - 3x + 1 = 0$ by Newton- Raphson's method, correct to 4 decimal places. (with $\varepsilon = 0.0001$) 3

2. (a) Define transcendental equation with example. 1

(b) How do you consider the initial approximation to the root of the equation f(x)=0? $1\frac{3}{4}$

(c) Write the procedure of successive approximation method. When does this method converge? 3

(d) Use iteration method to evaluate $\sqrt{30}$ correct to three decimal places with an accuracy of 10^{-3}. 3

3. (a) What is forward differences? Briefly discuss the forward difference table. Determine the difference table for the values of y given in the following table. $5\frac{3}{4}$

x	3	4	5	6	7	8	9
y	2.7	6.4	12.5	21.6	34.3	51.2	72.9

(b) Find the value of y(1) and y(10) from the above table using the difference table. 3

5. (a) Derive Simpson's 1/3 rule for numerical Integration. $3\frac{3}{4}$

(b) Evaluate $I=\int_0^1 \frac{dx}{1+x}$, Correct to 3 decimal places using both Trapezoidal and Simpson's rule for h=0.25 5

6. (a) Describe the Modified Euler's method to solve the ordinary differential equation. What is the advantage of Modified Euler's method over Euler's method? 5

(b) Using Euler's formula, solve the following differential equation. $3\frac{3}{4}$

$\frac{dy}{dx}-1=y^2$, y(0)=0.

In each case take h=0.1 and y(0.1) and y(0.3).