

# SYLHET ENGINEERING COLLEGE

## EEE 305

### Term Test: 2

- 1 Explain the difference between open and closed methods of finding roots. 2  
 → Open method generally needs only one initial guess but close method generally needs 2 or more initial guesses.

- 2 Andy wants to find the roots of the equation 4  

$$f(x) = 2 \sin(\sqrt{x}) - x$$
  
 Use simple fixed-point iteration to locate the root of  
 Use an initial guess of  $x_0 = 0.5$  and iterate until  $\epsilon_a \leq 0.001\%$ .

→  $f(x) = 2 \sin(\sqrt{x}) - x$   
 $x_i = 2 \sin(\text{root}(x))$   $x_0 = 0.5$

$x_0$	$x_i$	$\%e_a$
	0.5	61.51696664
	1.299274	28.49926188
	1.817148	6.840366928
	1.950574	0.973152375
	1.969743	0.117965856
	1.972069	0.013957858
	1.972344	0.001646628
	1.972377	0.000194187

- 3 Use the modified secant method to estimate root of  $f(x) = e^{-x} - x^2 - x$  5  
 Use a value of 0.01 for  $\delta$  and start with  $x_0 = 1$

$$x_{i+1} = x_i - \frac{\delta x_i f(x_i)}{f(x_i + \delta x_i) - f(x_i)}$$

→ use of Delta=0.01

$x_i$	$f(x_i)$	$x_i + \delta x_i$	$f(x_i + \delta x_i)$	$x_{i+1}$	$\%e_a$
1	-1.63212	1.01	-1.66588	0.516559	93.58888692
0.516559	-0.18682	0.526559	-0.21319	0.445705	15.89702945
0.445705	-0.00398	0.455705	-0.02937	0.444135	0.353416017
0.444135	-1.2E-05	0.454135	-0.02538	0.44413	0.001097355

- 4 Use Gauss Jordan Elimination to solve for the variable  $x_1, x_2, x_3$  5  

$$3x_1 + 9x_2 + x_3 = 6$$

$$6x_1 + 2x_2 + 8x_3 = 8$$

$$9x_1 + 6x_2 + 3x_3 = 3$$
  
 Keep your answers in fraction for the simplicity.

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## EEE 305

### Term Test: 2

→

Divide row1 by 3

1	3	1/3	2
6	2	8	8
9	6	3	3

Add  $(-6 * \text{row1})$  to row2

1	3	1/3	2
0	-16	6	-4
9	6	3	3

Add  $(-9 * \text{row1})$  to row3

1	3	1/3	2
0	-16	6	-4
0	-21	0	-15

Divide row2 by -16

1	3	1/3	2
0	1	-3/8	1/4
0	-21	0	-15

Add  $(21 * \text{row2})$  to row3

1	3	1/3	2
0	1	-3/8	1/4
0	0	-63/8	-39/4

Divide row3 by -63/8

1	3	1/3	2
0	1	-3/8	1/4
0	0	1	26/21

Add  $(3/8 * \text{row3})$  to row2

1	3	1/3	2
0	1	0	5/7
0	0	1	26/21

Add  $(-1/3 * \text{row3})$  to row1

1	3	0	100/63
0	1	0	5/7
0	0	1	26/21

Add  $(-3 * \text{row2})$  to row1

1	0	0	-5/9
0	1	0	5/7
0	0	1	26/21

Total Mark: 20 Marks

Total Time: 40 Minutes

# SYLHET ENGINEERING COLLEGE

## EEE 305

### Term Test: 2

- 5 Use Cramer's rule to solve the equations in question 4  
Write down the main matrix and find its determinant

4

**X1 X2 X3**

1 3 9 1

2 6 2 8

3 9 6 3

$$\Delta = 378$$

Replace the 1st column of the main matrix with the solution vector and find its determinant

**X1 X2 X3**

1 6 9 1

2 8 2 8

3 3 6 3

$$\Delta_1 = -210$$

Replace the 2nd column of the main matrix with the solution vector and find its determinant

**X1 X2 X3**

1 3 6 1

2 6 8 8

3 9 3 3

$$\Delta_2 = 270$$

Replace the 3rd column of the main matrix with the solution vector and find its determinant

**X1 X2 X3**

1 3 9 6

2 6 2 8

3 9 6 3

$$\Delta_3 = 468$$

$$x_1 = \Delta_1 / \Delta = (-210) / 378 = -5/9 = -0.556$$

$$x_2 = \Delta_2 / \Delta = 270 / 378 = 5/7 = 0.714$$

$$x_3 = \Delta_3 / \Delta = 468 / 378 = 26/21 = 1.238$$