Department of Electrical Engineering Mid – Term Assignment Spring 2020 Date: 20/04/2020

Course Details

Course Title:	Numerical Analysis	Module: _	
Instructor:	Sir Muhammad Waqas	Total Marks:	30

Student Details

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Q1.	(a)	1.	A 3x3 ident	ity matrix has	a total of 3 and	Eige	en values.			Marks 11
			a. <u>same</u>			b.	different			CLO 1
			c. none			d.	zero			
		2.	Eigen value	s of a symmet	ric matrix are all _					
			a. <u>real</u>			b.	complex			
			c. zero			d.	positive			
		3.	All of the fo	ollowing are fi	nite difference met	thods exc	ept for			
			a. Jacob	oi's method		b.	Newton's	backward	difference	
							<u>method</u>			
			c. Stirlli	ing formula		d.	Forward diff	erence meth	nod	
		4.	The charact	eristics polyne	omial of a 3x3 iden	ntity matr	ix is	_, if x is th	e Eigen value of	the
			3x3 identity	matrix.						
			a. (x-1) ²	3		b.	$(x+1)^3$			
			c. $x^3 - 1$	-		d.	$x^{3} + 1$			
		5.	Two matrix	es with the sau	ne characteristic p	olynomia	l does not nee	d to be simi	lar	
			a. True			b.	<u>false</u>			
		6.	Is the determ	ninant of a dia	igonal matrix the p	roduct of	the diagonal e	elements?		
			a. <u>true</u>			b.	false			
		7.	The Jacobi's	s method is a r	nethod of solving a	ı matrix e	quation on a m	natrix that h	as zeros alo	ong
			its main dia	gonal.						
			a. <u>No</u>			b.	At least one			
			c. At lea	ast two		d.	At least three	e		
		8.	The power 1	method can be	used only to find	the Eigen	value of "A"	that is large	est in absolute val	ue,
			we call this	Eigen vale the	e dominant Eigen v	value of "	A".			
			a. <u>true</u>			b.	false			
		9.	Central diffe	erence method	l is the finite differ	ence metl	nod.			
			a. <u>True</u>	<u>.</u>		b.	false			
		10.	Iterative alg	orithms can b	e more rapid than o	lirect met	hods.			
			a. true			b.	<u>false</u>			
		11.	$\Delta f_r = f_{r+1} \cdot$	$- f_r$ is known	n as dif	ference of	perator.			
			a. <u>forwa</u>	ard		b.	backward			
			c. centra	al		<u>d.</u>	none			
Q2.	(a)	Us	se bisection m	ethod to solve	the equation $x^2 - 2$	7 = 0, Perf	form four itera	ations and sh	now all the necess	ary Marks 6
		ste	eps.							CLO 1
Q3.	(a)	In	terpolate the v	value of 0.25 u	using Newton's for	ward diff	erence formul	la. Show all	the necessary ste	ps. Marks 6
		2	K	0.2	0.3	0.4	0.5		0.6	CLO 1
		I	$F(\mathbf{x})$	0.2304	0.2788	0.3222	0.36	517	0.3979	
	(b)	U	se Newton Ra	phson method	l to find root of f(x	$=x^{3}-2$	$x + 2$ with $x_0 =$	= 0.2. Perfo	orm four iteration	s. Marks 6
										CLO 1

a Munammad Maaz	Akhunzada
Q No :1	ID: 11448
Part (A)	
Multiple Choice Questions:	
 A 3x3 identity matrix has a total of a. same 	of 3 and Eigen values.
C. none	d zero
 Ligen values of a symmetric matr 	ix are all
a. real	b. complex
3 Aller	d. positive
3. All of the following are finite diffe	erence methods except for
a. Jacobi's method	b. Newton's backward
e 611 11	difference method
4 The starting formula	d. Forward difference method
 The characteristics polynomial of the 2 pairs 	f a 3x3 identity matrix is, if x is the Eigen value o
the 3x3 identity matrix.	
a. (x-1) ³	b. (x+1) ³
$\frac{c. x^3 - 1}{c}$	d. x ³ + 1
5. Two matrixes with the same char	racteristic polynomial does not need to be similar
a. true	b. false
Is the determinant of a diagonal	matrix the product of the diagonal elements?
a. true	b. false
7. The Jacobi's method is a method	of solving a matrix equation on a matrix that has zero
along its main diagonal.	
along its main diagonal.	b. At least one
along its main diagonal. a. No c. At least two	b. At least one d. At least three
along its main diagonal. a. No c. At least two 3. The power method can be used	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolution
along its main diagonal. a. No c. At least two 3. The power method can be used value, we call this Eigen vale the	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolution dominant Eigen value of "A".
along its main diagonal. a. No c. At least two 3. The power method can be used value, we call this Eigen vale the a. true	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolu dominant Eigen value of "A". b. false
 along its main diagonal. a. No c. At least two 3. The power method can be used value, we call this Eigen vale the a. true b. Central difference method is the 	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolution dominant Eigen value of "A". b. false finite difference method.
 along its main diagonal. a. No c. At least two 3. The power method can be used value, we call this Eigen vale the a. true b. Central difference method is the 	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolu dominant Eigen value of "A". b. false finite difference method. b. false
 along its main diagonal. a. No c. At least two 3. The power method can be used value, we call this Eigen vale the a. true 3. Central difference method is the a. true 3. Central difference method is the a. true	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolution dominant Eigen value of "A". b. false finite difference method. b. false
 along its main diagonal. a. No c. At least two 3. The power method can be used value, we call this Eigen vale the a. true b. Central difference method is the a. true c. Iterative algorithms can be more 	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolution dominant Eigen value of "A". b. false finite difference method. b. false e rapid than direct methods.
 along its main diagonal. a. No c. At least two 3. The power method can be used value, we call this Eigen vale the a. true b. Central difference method is the a. true c. Iterative algorithms can be more a. true 	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolution dominant Eigen value of "A". b. false finite difference method. b. false e rapid than direct methods. b. false difference operator
along its main diagonal. a. No c. At least two 3. The power method can be used value, we call this Eigen vale the a. true b. Central difference method is the a. true c. Iterative algorithms can be more a. true 1. $\Delta f_r = f_{r+1} - f_r$ is known as	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolu dominant Eigen value of "A". b. false finite difference method. b. false e rapid than direct methods. b. false difference operator.
along its main diagonal. a. No c. At least two 3. The power method can be used value, we call this Eigen vale the a. true b. Central difference method is the a. true c. Iterative algorithms can be more a. true 1. $\Delta f_r = f_{r+1} - f_r$ is known as a. forward	 b. At least one d. At least three only to find the Eigen value of "A" that is largest in absolut dominant Eigen value of "A". b. false finite difference method. b. false e rapid than direct methods. b. false difference operator. b. backward

COURSE DEPARTMENT .-NUMERICAL ANALYSIS BELES Patto. QNOHZ (A) Use bisection method to solve the equation 2-7=0. Perform four iterations and shows all the necessary Steps:-NOLUTION:- $F(x) = x^2 - 7 = 0$ STEP NO 1:-Assume Limits [Lower, Upper] $Limits = \begin{bmatrix} 1 & R \end{bmatrix}$ $F(1) = (1)^2 - (7) = -6$ $F(2) = (2)^2 - 7 = -3$ $F_1 \times F_2 = -6x - 3$ [=+18>0] ITRATION:-NEW Limit:-[1,3]

 $F(3) = (3)^2 - 7 = 2$ 11448 Pattoz. $F(1) \times F(3) = -6 \times 2$ =-12<0 TEP 2:of F(l) × F(U) = Ans < 0 then find mid point. => If F(l) × F(U) = Ans >0 then change limit by finding. Find C=? mid point $C = \frac{1+3}{2} = \frac{4}{2}$ F= 2 | Putting in the eq $F(c) = (2)^2 - 7 = -3$ ITERATION 2 Now Limit [2,3] Mid Point = ? $C = \frac{2+3}{2} = \frac{5}{2}$ = 2.5 put in eq]

1114481 $F(2.5) = (2.5)^{2} - 7 = 6.25 - 7$ 1gtto3 = 1-0.75 (. $F(2.5) \times F(3) = (-0.75) \times 2 =$ 340 1=-1.5<07 STEP NO:-3 [2:5:3] ITERATION :-C= 2:5+3 = 2:75 Putinezy $F(c) = (2.75)^2 - 7 = -5.625$ F(c) × F(U) = -5.625×3 = -4<07 [2.75,3] Step 41- $\frac{\text{ITERATION!}}{C = 275 + 3} = 2.875 \text{ put in equ$ $F(C) = (2.875)^2 - 7 = 1.265$ $F(C) \times F(3) = 1.265 \times 2 = [2.5370]$ ID 11448 5 Pg# 04 $F(c) \times F(2.75) = 1.265 \times -5625 = -7, 115.6 < 0$ [2.75, 2.875)

QNO-3		10 1144	8	LPE	j# 05
Barmand ?	Interplate lifference	the value formula.	e of 0:2 Show all	's using the ree	Newton's ssary steps.
X	0.2	0.3	0.4	0.5	0.6
F(x)	0.2304	0.2788	O.3222	0.3617	0.3979
STEP NO	o 1				
	<u> </u>	<u>IFFERENCE</u>	TABLE:		
X	y	\triangle	Δ_2	Δ_3	Δ_4
0.2					
0.2	0.2304	0.0484	-0.005	+0.0011	0.0005
0.2	0.2304 0.2788	0.0484 0. 9 434	-0.005 -0.0039	+0.0011	0.0005
0.2	0.2.304 0.2788 0.3222	0.0484 0. 9 434 0.0395	-0.005 -0.0039 -0.0033	+0.0011 0.0006	0.0005
0.2	0.2304 0.2788 0.3222 0.3617	0.0484 0.9434 0.0395 0.0362	-0.005 -0.0039 -0.0033	+0.0011 0.0006	0.0005
0.2 0.4 0.5 0.6	0.2.304 0.2788 0.3222 0.3617 0.3979	0.0484 0.9434 0.0395 0.0362	-0.005 -0.0039 -0.0033	+0.0011 0.0006	0.0005
0.3 0.4 0.5 0.6 STEP Z	0.2304 0.2788 0.3222 0.3617 0.3979	0.0484 0.9434 0.0395 0.0362	-0.005 -0.0039 -0.0033	+0.0011	0.0005
0.3 0.4 0.5 0.6 STEP Z 40	0.2.304 0.2788 0.3222 0.3617 0.3979	0.0484 0.9434 0.0395 0.0362	-0.005 -0.0039 -0.0033	+0.0011	0.0005
0.2 0.4 0.5 0.6 STEP Z 40 0.2304	0.2.304 0.2788 0.3222 0.3617 0.3979 0.3979	0.0484 0.9434 0.0395 0.0362 A240 -0.00	-0.005 -0.0039 -0.0033 -0.0033 -0.0033 -0.0033 -0.0033 -0.0033 -0.0033 -0.0033 -0.0033 -0.0033 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.0033 -0.0039 -0.0033 -0.0033 -0.0039 -0.0033 -0.0039 -0.0033 -0.0039 -0.0033 -0.0033 -0.0039 -0.0033 -0.0033 -0.0039 -0.0033 -0.0033 -0.0039 -0.0033 -0.0033 -0.0039 -0.0033 -0.0039 -0.0033 -0.0039 -0.0033 -0.0033 -0.0039 -0.0033 -0.0039 -0.0033 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.0039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.00039 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.0009 -0.00	+0.0011 0.0006	0.0005 44 46 2005

ID 11448 lg#06 STEP NOT 3 X= a+nh =) X= 0.25 3 a=> 0.2 $h = 0.4 [h = X_2 - X_1]$ Putting the Malues:-X= a+nh 0.25 = 0.2 + n(0.1)0.25 - 0.20 = n(0.1)0.05 = n(0.1) $\frac{\text{STEP No:-4}}{\text{Now find } n=?} = 0.5$ 0.1 N= 0.5 yo= 0.2304, Ayo= 0.0484, Azyo= 000 ∆240=-0.005, ∆340=+0.0011, ∆440=0.0005 Put the values In formula STEP NO: $f(x) = y_0 + n\Delta y_0 + n(n-1) \Delta_2 y_0 + n(n-1)(n-2) \Delta_3 y_0 + n(n-1)(n-2)(n-3)$ Dy yo

ID 11448 F(n) = 0.2304 + (0.5)(0.0484) + (0.5)(0.5-1)(-0.005)+0.5(0.5-1)(0.5-2)(+0.0011)+(0.5)(0.5-1)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(0.5-2)(03x2 X1 4x3x2x1 (0.0005)F(x) = 0.2304 + 0.0242 + (0.25)(0.005) $+ \underbrace{(0.375)}_{6} \underbrace{(0.0011)}_{1} + \underbrace{(-0.9375)}_{24} \underbrace{(0.0005)}_{1}$ = 0.2304 + 0.0242 + 0.000625+0.0006875+ 0.0000195313 = 0.2559320313 Ans:-QNO3 Use Newton Raphson Method to find root <u>Part B</u> of $f(\pi) = \pi^3 - 2\pi + 2$ with $\pi = 0.2$ Perform for iterations. Soli- Using Nellton Raphson formula: $\lambda i + 1 = \lambda i - F(\lambda i)$ F'(xi) Put f(x,) ef f'(ni) values $\chi_{i} + 1 = \chi_{i} - (\chi_{i}^{3} - 2\chi_{i} + 2)$ (3xi2-2)

ID 11448 1 Pg#08 = xi(3xi2-2) - (xi3-2xi+2) 3x12 -2. = 3x³i - 2xi - x²i + 2xi - 2 322-2 $xi + 1 = 2x^{3}i - 2$ 3x2- - - 2 ITERATION 1:- $\chi_0 = 0.2$ $= 2(0.2)^3 - 2$ 3(0.2)2-2 = + 1.984 = 1.0553 × 1.88 ITERATION 2:- $X_0 = 1.0553$ $= 2(\chi^{3}i) - 2$ 3(xí)-2 $= \frac{2(1.0553)^{3}-2}{3(1.0553)^{2}-2} = \frac{0.3504}{1.3409} = \frac{0.2613}{1.3409}$ ITERATION 3:- $X_0 = 0.2613$ $= \frac{2\pi^{3}i-2}{3\pi^{2}i^{2}-2} = \frac{2(0\cdot 2613)^{3}-2}{3(0\cdot 2613)^{2}-2}$

