Prince Sultan University

MATH 221

Major Test I

Semester I, Term 161

Thursday, November 10, 2016

Time Allowed: **90** minutes

Student Name: _____

Student ID #: _____

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. This examination has 6 problems, some with several parts. Make sure your paper has all these problems.

Question #	Max points	Student's Points
Q1	10	
Q2	8	
Q3	12	
Q4	10	
Q5	8	
Q6	12	
Total	**60**	

Q-1(10 points) Consider the mathematical problem P defined by $z = x + y$. Defining the approximation by

$\Delta x = x - \hat{x}$ and $\Delta y = y - \hat{y}$, show that the problem is well conditioned with respect to the absolute error κ_A.

Q-2(8 Points) Let α_1 and α_2 be two fixed point of the quadratic function $f(x) = 0.5x^2 - 1.5x + 2$
a) Find the values of both fixed points
b) For which point the fixed point method will converge

Q-3 (12 Points) What is the order of convergence of the iteration
$$x_{n+1} = \frac{x_n(x_n^2 + 3b)}{3x_n^2 + b}$$
as it converges to a fixed point $\alpha = \sqrt{b}$?

Q-4 (10 Points) Show that the iterative procedure for evaluating the reciprocal of a number N using secant method is
$$x_{n+1} = x_n + (1 - Nx_n)x_{n-1}, \qquad n = 1, 2, \cdots$$

Q-5(8 points) Let $f(x) = -x^3 - \cos x$, and $p_0 = -1$. Use Newton's method to find p_1 and p_2

Q-6 (12 Points) Find an approximation to a zero of $P(x) = 2x^4 - 3x^2 + 3x - 4$ using Newton's method with $x_0 = -2$ and Horner's method to find $P(-2)$ and $P'(-2)$.