Menofia University
Faculty of Engineering
Shebien El-kom
Basic Engineering Sci. Department.

Academic Year: 2019-2020

Date: 19 / 08 / 20120

Minoufla Unive

Subject: Applied numerical analysis and programming

Code: BES 512

Time Allowed: 3 hours

Year: Master

Total Marks: 100 Marks

Answer all the following questions:

Q1

(40 Marks)

- (a) Use the simple iteration method to find the smaller positive root of the equation  $x^3 7x + 1 = 0$ , correct to three decimal places and the larger positive root to two decimal places, hence find the third root.
- (b) Use Newton's method to find the positive root, correct to three decimal places, of the equation  $f(x) = x 2 \sin x = 0$ .
- (c) Find the real root of the equation  $5x^3 + x^2 2 = 0$ . Correct to four decimal places by the bisection method.
- (d) Use Newton-Raphson method to solve the following system of equations:  $f(x,y) = x^2 + y 3 = 0$ ,  $g(x,y) = x + y^2 5 = 0$ . Close to the point (2,-2).

<u>Q2</u>

(35 Marks)

(a) Use the following readings to fit the equation  $y = a e^{bx}$ .

$\boldsymbol{x}$	1	2	3	4	5	6	7	8
у	15.3	20.5	27.4	36.6	49.1	65.6	87.8	117.6

(b) Evaluate f(1.03) and f(1.27) from the following table:

x	1.0	1.05	1.10	1.15	1.20	1.25
y	1.0	1.257625	1.531	1.820875	2.128	2.463125

<u>Q3</u> (25 Marks)

(a) Define the Expressions: Basic solution, Extreme point, Convex set, Hyper-plane.

- (b) Prove that the intersection of two convex sets is a convex set.
- (c) Using Simplex method, solve the following linear programming problem:

Maximize 
$$Z = 2x_1 + x_2$$
  
Subject to
$$x_1 + 2x_2 \le 10$$

$$2x_1 + x_2 \le 11$$

$$x_1 - x_2 \le 3$$

$$x_1, x_2 \ge 0$$

Good Luck