Time Allowed:1 hour	Spring 2017	Max.Marks: 30
Course Code: MT 207	Numerical Methods	Date: 22-02-2017

Instructions

- Attempt ALL questions
- Sharing of calculators and other stationery items is strictly not allowed

Q.1 Solve the system of equations starting with initial vector (0,0,0) using Gauss-Seidel method

$$4.63x - 1.21y + 3.22z = 2.22$$
$$-3.07x + 5.48y + 2.11z = -3.17$$
$$1.26x + 3.11y + 4.57z = 5.11$$

Perform three iterations. State whether the Gauss-Seidel diverges or converges. [10]

Q.2 Suppose that a projectile is fired from the origin with an angle of elevation b_0. Also, assume that the air resistance is proportional to the velocity, the equation of motion is then given by,

$$y = f(t) = (Cv_y + 32C^2)(1 - e^{-t/C}) - 32Ct$$
$$x = r(t) = Cv_x(1 - e^{-t/C})$$

Where,

$v_x = v_0 \cos b_0$, $v_y = v_0 \sin b_0$, $C = m/k$ and k is the coefficient of air resistance and m is the mass of projectile. Solving $f(t) = 0$ means to find the elapsed time until the projectile hits the ground.

a) Suppose that $b_0 = \frac{\pi}{4}$, $v_x = v_y = 160 \, ft/sec$ and $C = 10$. Find the elapsed time until the impact using Newton-Raphson method with an initial guess 8 sec. (Take the tolerance value to be 0.0001). [5]

b) Find the height in each iteration in part (a). Also, find the range $x = r(t)$. [5]

Q.3 Give geometric interpretation and derivation of Regula-Falsi method. [10]

You have asked me to give you a message. What message can I give you? We have got the great message in the Quran for our guidance and enlightenment. (M.A. Jinnah's Message to NWFP Muslim Students Federation, April 1943)