National University of Computer & Emerging Sciences, Karachi

Spring -2017 CS-Department

MidTerm 2

29th March 2017, 11:00 am – 12pm

Course Code: MT-207	Course Name: Numerical Methods
Instructor Name: Syed M. Fahad Riaz	
Student Roll No:	Section No:

Instructions (Can vary according to requirements):

- Return the question paper.
- Read each question completely before answering it. There are **3 questions and 1 page**.
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.
- All the answers must be solved according to the sequence given in the question paper.
- This paper is subjective

Time: 60 minutes. **Max Marks**: 30 points

Question 1:

Use the Adam-Bashforth-Moulton method, the three starting points and the step size h=0.05 to calculate the next two values, y_4 and y_5 for the IVP given below: [10]

$$y' = t^2 - y, y(0) = 1 \; over \; [0,5]$$

$$y_1 = 0.9513$$
$$y_2 = 0.9052$$
$$y_3 = 0.8618$$

Question 2:

Consider the non-linear system [5+5]

$$x^2 - 2x - y + 0.5 = 0$$
$$x^2 + 4y^2 - 4 = 0$$

with the starting value $(p_0, q_0) = (2.00,\ 0.25)$

(a) Compute the Jacobian matrix and check whether the Jacobian matrix is invertible.

(b) Use newton's method to compute $(p_1, q_1), (p_2, q_2)$ and (p_3, q_3)

Question 3:

a) Write an algorithm of LU decomposition for 4x4 system and also state the number of equations and number of unknowns when LU decomposition method is applied. [5]

b) Use LU decomposition and Doolittle's method to solve the following linear system: [5]

$$x + y + z = 5$$
$$x + 2y + 2z = 6$$
$$x + 2y + 3z = 8$$

BEST OF LUCK!