INDIAN INSTITUTE OF TECHNOLOGY MADRAS

Department of Chemical Engineering

Simulation lab (CH2082)

Assignment 1 – (05/03/2014)

Instructions

1. Attempt all problems on your own.

2. You may discuss with the TAs for assistance.

3. All variables should be declared or initialized within your program

4. Name each program using the following convention using a combination of your roll number, assignment number and question number. i.e., if your roll number is CH12B001, name the program in the first question of the first assignment as follows:CH12B001_A1_Q1.m

5. Submit a single zipped folder (named accordingly e.g. CH12B001_A2) in moodle which contain matlab codes (m files) for each question and one pdf file (after publishing)

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1. You have the following data of x and y tabulated in Table 1. You have to postulate three models to explain the relationship between x and y. Which of the three would you recommend and why?

Table 1: Model discrimination

x	y
10	1,0
20	1.26
30	1.86
40	3.31
50	7.08

$$y = e^{\alpha+\beta x} \quad (1)$$
$$y = e^{\alpha+\beta_1 x+\beta_2 x^2} \quad (2)$$
$$y = \alpha x^{\beta} \quad (3)$$
$$y = \alpha + \beta x \quad (4)$$
$$y = \alpha + \beta_1 x + \beta_2 x^2 \quad (5)$$

2. A firm has determined that the cost z of fabricating a plant is a function of labour x and engineering units y and can be explained by the following model:

$$z = a_0 + a_1 x + a_2 y$$

The firm has the following data available in Table 2.

Table 2: Cost data for plant fabrication

Cost z	Labour x	Engineering units y
310	120	55
300	130	50
275	108	52
250	110	42
220	84	40
200	90	30
190	80	23
150	55	12
140	64	19
100	50	10

3. A cricket ball is dropped from the top of a building of height 200m.

Write a function file such that output gives

a. Time it takes to reach the ground

b. Speed with which it hits the ground

Input to the function should be height from which ball is dropped.

4. Create a m-file to establish the below matrix for given "n"

$$\begin{bmatrix} n & n-1 & n-2 & \cdots & 0 \\ n+1 & n & n-1 & \cdots & 1 \\ n+2 & n+1 & n & \cdots & 2 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 2n & 2n-1 & 2n-2 & \cdots & n \end{bmatrix}_{(n+1)\times(n+1)}$$

5. Write a matlab(.m) file to plot r(radius) of ellipse with a = 4 and b = 7 as θ goes from 0 to π. Also plot the value of θ ranging 0 to π.

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$$