Philadelphia University
Faculty of Engineering

Student Name:
Student Number:

Dept. of Computer Engineering
Mid Exam, First Semester: 2007/2008

Course Title: Modeling & Simulation	**Date: 28/11/2007**
Course No: (630573)	**Time Allowed: 1 Hour**
Lecturer: Dr. Mohammed Mahdi	**No. of Pages: 1**

Question 1: ***(6 Marks)***

Objectives:
This question is about the principles of modeling and simulation.

A) Choose the right answer: -

1. **Simulation enables: -**
   a) **The study of complex systems.**
   b) **Experimentation of complex systems.**
   c) **Analysis of variables interaction of complex systems.**
   d) **All above.**
2. **Simulation can be used to: -**
   a) **Verify analytical solutions.**
   b) **Analysis systems.**
   c) **Design new systems.**
   d) **All above.**

B) Explain the following briefly: -

- **In practice how one can choose between using physical laws or measurements to identify a system?**
- **When magnitude scaling can be used? Why?**
- **State the main advantages of simulation.**

Question 2: ***(10 Marks)***

Objectives:
This question is about analog simulation.

A) Draw the analog simulation circuit diagram to simulate the following relation: -

$$\dot{x} + y = 2$$
$$\ddot{y} + 5\dot{y} + x = 4$$

B) Given the following system $\dddot{y} + 3\ddot{y} + 2\dot{y} = x$**, it is required to: -**

- **Extract the system ID, giving the reason.**
- **Sketch the analog simulation circuit diagram using state-space representation.**

Question 3: ***(9 Marks)***

Objectives:
This question is about model analysis.

Taking the general model of first order systems, it is required to: -

- **Derive the general time response for unit step change in input.**
- **Apply initial and final value theorem for both time and frequency domains.**
- **Write down the canonical state-space representation.**