NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCES
COMPUTER SCIENCE DEPARTMENT
JANUARY EXAMINATIONS 2013

SUBJECT: SIMULATION AND MODELLING
CODE: SCS 6106

INSTRUCTIONS TO CANDIDATES
Answer any four (4) questions.
Each question carries 25 marks.
You may use Scientific Calculators and Statistical Tables.

Time:3 hours

QUESTION ONE

Using suitable examples compare and contrast the simulation of queuing systems versus the simulation of inventory systems. [25]

QUESTION TWO

a) Determine who the following performance measures can be obtained in a simulation run:

    i.   Average time in system [2]

    ii.   % idle time [2]

    iii. Average waiting time per customer [2]

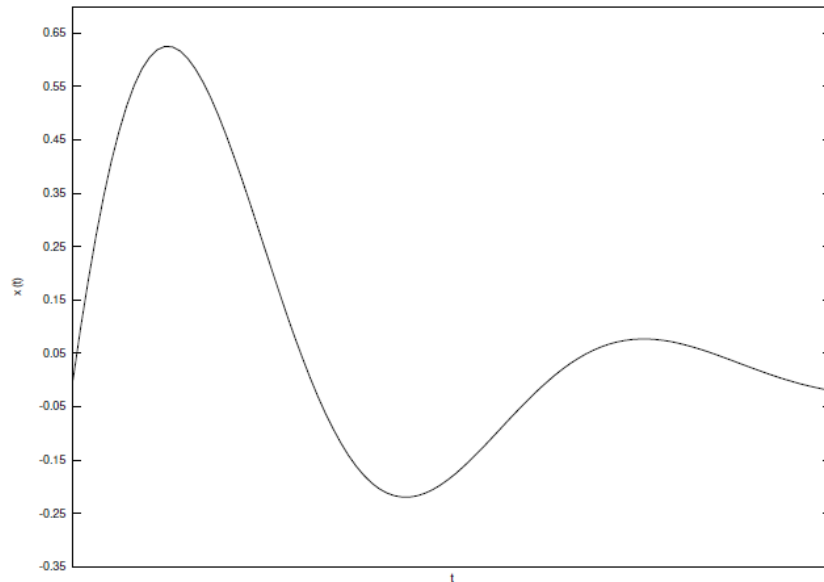   iv. Fraction having to wait [2]

    v.   Average waiting time of those that waited [2]

b) List five different tools that may be used to assist in the analysis of business processes. [5]

c) Describe the Bayesian melding approach for inference from deterministic simulation models. [10]

QUESTION THREE

a) Discuss the two types of discretisation possible for continuous systems

like the one illustrated in figure 3.1 below.   [10]

Figure 3.1 Continuous System

b) The atomic DEVS formalism is a structure describing the different aspects of the discrete-event behaviour of a system. Expound.   [15]

QUESTION FOUR

a) Give three advantages and two disadvantages of simulation.   [5]

b) List three simulation capabilities and two limitations of simulation.

[5]

c) Among the steps of a simulation study, select one stage and fully describe the activities and processes in that stage. Illustrate how the predecessor and successor steps supply input and output respectively for that stage.

[15]

QUESTION FIVE

a) Use the Chi-Square test with $\alpha = 0.05$ to test whether the data shown below in Table 5.1 are uniformly distributed.   [10]

0.34	0.9	0.25	0.89	0.87	0.44	0.12	0.21	0.46	0.67
0.83	0.76	0.79	0.64	0.7	0.81	0.94	0.74	0.22	0.74
0.96	0.99	0.77	0.67	0.56	0.41	0.52	0.73	0.99	0.02
0.47	0.30	0.17	0.82	0.56	0.05	0.45	0.31	0.78	0.05
0.79	0.71	0.23	0.19	0.82	0.93	0.65	0.37	0.39	0.42
0.99	0.17	0.99	0.46	0.05	0.66	0.10	0.42	0.18	0.49
0.37	0.51	0.54	0.01	0.81	0.28	0.69	0.34	0.75	0.49
0.72	0.43	0.56	0.97	0.30	0.94	0.96	0.58	0.73	0.05
0.06	0.39	0.84	0.24	0.40	0.64	0.40	0.19	0.79	0.62
0.18	0.26	0.97	0.88	0.64	0.47	0.60	0.11	0.29	0.78

Table 5.1 Sample Data

b) Describe at least three possible attitudes that one may find when introducing simulation to an organization. [15]

QUESTION SIX

Discuss the relationships of the cost of performing a simulation model validation and the value of the model to the user as a function of model confidence as illustrated in Figure 6.1. [25]
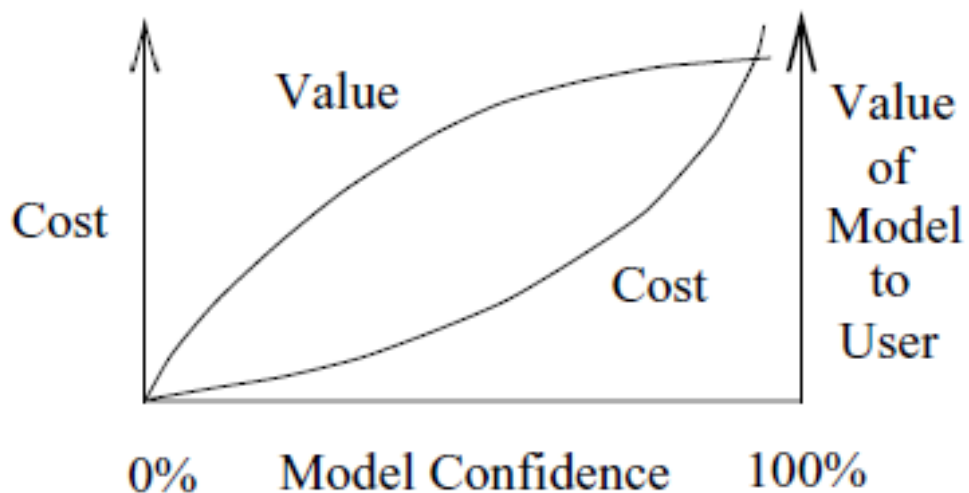

Figure 6.1: Model Confidence

THE END