NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCE
COMPUTER SCIENCE DEPARTMENT
JUNE EXAMINATIONS 2004

SUBJECT: SIMULATION ANDMODELLING QUESTION SEVEN
CODE: SCS4108/ SCS6106

INSTRUCTION TO CANDIDATES

ANSWER **ALL** QUESTIONS IN SECTION A AND ANY **TWO** QUESTIONS IN SECTION B.

Time: 3 hours

SECTION A (ANSWER ALL OF THE QUESTIONS IN THIS SECTION)

i)   Discuss what modeling and simulation is, types of models, types of simulation, roles for simulation, and stages in problem solving using simulation.   [8]

ii)   Discuss the eight system thinking skills discussed in the tutorial / PDF file on systems thinking?   [8]

iii) Construct a system dynamics model of the population of Southern Africa and how it is impacted by the AIDS pandemic. Consider births, deaths, and migration. Break the population up into age categories. Show the stock and flow diagram, Bulls eye diagram and causal loop diagram.   [10]

iv) Consider the 1st order negative feedback system – Goal seeking model discussed in class where you have an inventory that you want to reach a 'desired inventory'. The Order rate (OR) = (desired_inventory – inventory)/(adjustment_time) and The Sales = Sales_rate * inventory.

a. Given the desired inventory of 150, adjustment_time of 5 weeks, and Sales_rate of 20% calculate the inventory at equilibrium. [5]
b. Calculate the adjustment that must be made to the desired_inventory to reach an equilibrium inventory of 120. [5]
You must show your work.

v) Draw the flowchart model corresponding to an Arena simulation of ComOil Airport Road Garage. There is one pump for petrol and one pump for diesel and everyone pays for fuel in advance to a single agent. The garage also operates a Take Away with one worker behind the counter. The model should indicate the characteristics of the entities, resources and modules. [10]

vi) We initially run n_0 = 10 replications of a simulation and get a half-width of h_0 = 16. We have to reduce the half-width to 4. How many simulations replications must we run? **Show your calculations**. [10]

vii) Discuss the following features of Arena:
a) Spreadsheet view. [2]
b) Input analyzer. [2]
c) Output analyzer. [2]
d) Process Analyzer. [2]
e) Submodels. [2]
f) Template panel options. [2]