BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

BSc HONS DEGREE IN COMPUTER SCIENCE

OCT 2024

BSc HONS DEGREE IN SOFTWARE ENGINEERING

CS403/SWE405: SIMULATION AND MODELLING

DURATION: 2 HOURS 30 MINUTES TOTAL MARKS: 100

INSTRUCTIONS TO CANDIDATES

The paper consists of five (5) questions, candidates are expected to answer all questions.

Question 1

a) Define a model and describe the purpose of a model. [4]
b) Why do we build models (as opposed to experiment on actual systems)? [6]
c) Define is performance, What is the performance measure of most interest for information systems? [4]
d) Differentiate between the following
   (i) Deterministic and stochastic model . [3]
   (ii) Static and dynamic simulation model. [3]

(20 Marks)

Question 2

a) Draw a flow chart diagram of steps involved in a simulation study [10]

b) Explain why optimization via simulation is difficult. [10]

(20 Marks)

Question 3

Differentiate discrete, continuous and stochastics systems with the aid of examples.

[20]

(20 Marks)

Question 4

Charles, who is a barber, has found out that he can shave on average 4 customers per hour. The arrival rate of customers averages 3 customers per hour.

Required:

a) The proportion of time that Charles is idle. **[5]**
b) The probability that a customer receives immediate service upon arrival. **[5]**
c) Average number of customers in the queuing system. **[5]**
d) Average time a customer spends in the queuing system. **[5]**

(20 Marks)

Question 5

A manufacturing company is planning to invest in a new production process. The expected annual revenue from this process is uncertain and depends on various factors. The company has identified the following probability distribution for the annual revenue:

Annual Revenue	Probability
$100,000	0.2
$150,000	0.4
$200,000	0.3
$250,000	0.1

The company also estimates the annual operating costs to be $80,000. Using a Monte Carlo simulation, determine the following:

a) The expected annual net profit from the new production process. **[10]**

b) The probability that the annual net profit will be greater than $100,000. **[10]**

(20 Marks)

END OF PAPER