



**RAJARATA UNIVERSITY OF SRI LANKA  
FACULTY OF APPLIED SCIENCES**

B. Sc (General) Degree  
Third Year – Semester I Examination – Oct/Nov 2014  
**COM 3302-COMPUTER SIMULATION**

**Answer four questions.**

**Time allowed: three hours.**

**1.**

(a) Briefly describe following terms:

- (i) Simulation
- (ii) Computer simulation
- (iii) Model
- (iv) Mathematical model
- (v) Physical model.

[25 marks]

(b) Discuss the advantages of simulation over experimenting with real systems. Provide suitable examples.

[25 marks]

(c) Briefly describe following:

- (i) Continuous systems
- (ii) Discrete systems

[15 marks]

(d) "Same system can be modeled as continuous and discrete models for different requirements." Explain above statement using a suitable example.

[20 marks]

(e) "Every model should be run for more than one time for same inputs to get a reasonable accurate answer." Do you agree with this statement? Explain your answer.

[15 marks]

**2.**

(a) Mention two reasons to introduce randomness into a simulation model.

[10 marks]

(b) Mention two natural phenomenons that are used to generate true random numbers.

[10 marks]

(c) Pseudo random numbers are used in most of simulation applications. Explain Why.

[10 marks]

(d) (i) What are the conditions that need to be satisfied in order to make the random numbers generated by congruential method to be full period?.

(ii) Generate first five uniformly distributed integer random numbers between 0 and 232 including these two numbers using congruential method.

[40 marks]

(e) Clearly mention steps that are necessary to identify a given set of random numbers that are uniformly distributed.

[30 marks]

### 3.

(a) You have been given two independent uniformly distributed random number sources (U1 and U2) between 0 and 1. Using accept-reject method generate random numbers in following distribution:

$$F(x) = 6x + 0.5 \quad 0 \leq x \leq 0.5$$

U1: 0.5, 0.99, 0.1, 0.33, 0.2

U2: 0.23, 0.89, 0.11, 0.44, 0.67

[40 marks]

(b) Mention two drawbacks of accept-reject method.

[10 marks]

(c) Explain the relationship between number of replication and accuracy of predictions of stochastic simulation process using a suitable equation. Assume number of replications is greater than 35.

[20 marks]

(d) You are given arrival times of a customers to an automated teller machine (ATM) for two year period. Clearly mention steps to generate the time between two successive arrivals of customers using above information.

[30 marks]

### 4.

(a) Provide two examples for steady state simulation.

[10 marks]

(b) What do you mean by Warm-Up period of steady state simulation?

[15 marks]

(c) Mention two possible actions that can be taken to avoid the effect of Warm-Up period.

[20 marks]

(d) Briefly explain the following techniques used in steady state simulation:

(i) Truncated replication

(ii) Batching in a single run

[30 marks]

(e) Mention one drawback for each technique that was mentioned in section 4.(c).

[10 marks]

(f) Explain how you would overcome one of the drawbacks mentioned in section (d).

[15 marks]

5.

(a) Explain the difference between deterministic optimization and stochastic optimization techniques.

[22 marks]

(b) A firm manufactures 3 products A, B and C. The mean profits are Rs.300, Rs.200 and Rs.400 respectively. The firm has two machines M1 and M2. **Table 1** provides the required processing time in minutes for each machine on each product.

Machine type	A	B	C
M1	4	3	5
M2	2	2	4

**Table 1**

Machines M1 and M2 have 2000 and 2500 machine-minutes respectively. The firm must manufacture at least 100 A's and 200 B's and 50 C's but no more than 150 A's. Detailed distribution of profits from each product is mentioned in the **Table 2**.

Product	Standard Deviation	Distribution Type
A	50	Normal
B	40	Normal
C	60	Normal

**Table 2**

Consider maximization of total profit, and answer the following

- Identify controls.
- Identify assumptions for above stochastic optimization problem.
- What are the response and possible response statistics?

[40 marks]

(c) Mention five different factors that directly affect the performance of optimization searching process for Arena OptQuest tool.

[20 marks]

(d) Explain the effect of three factors mentioned in the section 5(c) on the performance of the optimization process.

[18 marks]