



KENYA METHODIST UNIVERSITY

END OF 1ST TRIMESTER 2010 EXAMINATIONS

FACULTY : **COMPUTING AND INFORMATICS**
DEPARTMENT : **COMPUTER INFORMATION SYSTEMS**
UNIT CODE : **CISY 403**
UNIT TITLE : **SIMULATION AND MODELING**
TIME : **2 HOURS**

Instructions:

- Answer question 1 and any other 2 questions.

Question 1

- a) Outline the difference between;
- Continuous simulation models and discrete simulation model. (4 mks)
 - Deterministic model and probabilistic or stochastic model. (4 mks)
- b) A queuing system had the following data;

Inter-arrival time (Min)	Frequency	Service time (Min)	Frequency
1	5	1	10
2	15	2	30
3	12	3	7
4	7	4	3
5	8		
6	3		
TOTAL	50		50

- If you work with an organization that is experiencing queuing problems, explain how one can come up with the above data. (2 mks)
 - Prepare the probability density function (p.d.f) for the inter-arrival time and the service time. (2 mks)
 - In each of the above cases, prepare the cumulative density function (CDF). (2 mks)
- c) If the organization in (b) above starts work at 8.00 am every day, from Monday to Friday and work stops at 5p.m, simulate the first fifteen customers and determine the;
- Mean time a customer spends in the queue and system. (4 mks)
 - Arrival rate λ and service rate μ . (4 mks)
 - Traffic intensity ρ and service the system. (4 mks)
 - Mean time the service point is idle. (2 mks)
 - Mean number of customers in the queue. (2 mks)

Question 2

- a) Construct a congruential number generator with $M > 18$. (8 mks)
- b) Convert the generated numbers into the (0,1) interval. (2 mks)
- c) Test the generated numbers for randomness at 5% significance level. (10 mks)

Question 3

- a) In simulation the focus is on randomness. Explain. (4 mks)
- b) Outline the procedure of any four random sampling methods. (16 mks)

Question 4

- a)
 - i) Outline the key properties of a good random number generator. (4mks)
 - ii) Discuss the standard capabilities of a simulation language. (6 mks)
- b) Construct the 95% confidence interval for the mean of a random sample.
 - i) One hundred members with $\bar{x} = 6.5\text{Kg}$ and standard deviation of 15kg. (4 mks)
 - ii) Nine members with $\bar{x} = 68\text{kg}$ with standard deviation of 15kg. (4 mks)
 - iii) If the two random samples (i) and (ii) are from the same population, analyze the difference in their results. (2 mks)