TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

UNIVERSITY EXAMINATIONS FOR DEGREE IN:
BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

ICS 2307: SIMULATION & MODELLING

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions.
Attempt question **ONE (Compulsory)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Compute implementation of simulation is costly due to some reasons. State THREE reasons that accounts for this cost. **(3 marks)**

b) Describe any FIVE desirable features of a simulation software. **(5 marks)**

c) What is significance of randomness in simulation experiments **(2 marks)**

d) Explain THREE circumstances under which simulation experiments would be preferred over experimentation **(3 marks)**

e) Briefly elucidate the steps in a simulation study. **(8 marks)**

f) Let a = 5 m = 8 and c = 0. A seed $x_0 = 22$. Generate the first 3 random numbers **(4 marks)**

g) Define the following terms as used in simulation and modeling.
(i) Simulation
(ii) Measures of performance

(iii) System environment
(iv) Model **(4 marks)**

Question Two

a) Elucidate the components of a discrete event simulation model **(10 marks)**

b) A post office has two counters , which handles the business of money orders, registration letters etc. It has been found that the service time distribution for both the counties are exponential with mean service time of 4 minutes per customer. The customers are found to come in each counters in a Poisson fashion with a mean annual rate of 11 per hour. Calculate:

(i) Probability of having to wait for services for a customer **(3 marks)**
(ii) Average waiting time in the queue **(3 marks)**
(iii) Expected number of idle customer **(2 marks)**

c) A good queue model should posses the two important attributes, state them. **(2 marks)**

Question Three

A classical inventory problems concerns the purchase and sale of newspaper. The paper seller buys the papers for 33 cents each and sells them for 50 cents each. Newspapers not sold at the end for the day one scrap for 5 cents each Newspapers can be purchased in bundles of 10. Thus, the paper seller can buy 50, 60 and 50m. There are 3 types of newsdays, good, fair and poor with probabilities of 0.35, 0.45 and 0.20 respectively. The distribution of papers demanded on each of these days is givne in table 2.15. The profits are given by the following relationship.

Profit = (revere from sales) – (cost of newspaper) – (loss profits from excess demand) +

(salvage from sale of scrap papers)

Table 2.5

Demand Probability Distribution			
Demand	Good	Fair	Poor
40	0.03	0.10	0.44
50	0.05	0.18	0.22
60	0.15	0.40	0.16
70	0.20	0.20	0.12
80	0.35	0.08	0.06
90	0.15	0.04	0.00
100	0.07	0.00	0.00

Required:

Determine the optimal number of papers the newspaper seller should purchase, this will be accomplished by simulating demands for 20 days and recording profits from sales each day.
(20 marks)

Question Four

A company trading in motor vehicle parts wishes to determine the levels of stock it should carry for the in the range. Demand is not certain and there is a lead the for stock replenishment for item x, the following information is obtained.

Demand (unit per day)	Probability

3	0.1
4	0.2
5	0.3
6	0.3
7	0.1

Carrying cost per unit day 2/

Ordering cost per order 50/-

Lead time for replenishment 3

Stock time for replenishment in day: 20 units

Required:

Carry out a simulation run over a 10 days period with the objective of evaluating the following inventory rule.

Order 15 units when present inventory plus any outstanding order falls below 15 units.

The sequence of random numbers to be used are:

0, 9, 1, 1, 5, 1, 8, 6, 3, 5, 7, 1, 2, 9 using the first number for day 1 your calculation should include the total cost of operating for this inventory for 10 days.

Question Five

a) Which are the major industries where simulation is used. Name any TWO simulation softwares. **(4 marks)**

b) The basic elements of a queuing model depend on several factors. State seven of these factors. **(6 marks)**

c) At one man barbers shop, customers arrive according to the poison distribution with a mean arrives rate of 4 per hour and his hair cutting time was exponentially distributed with an average hair-cut taking 12minutes there is no restriction in queue length. Calculate the following:

(i) Expected time in minutes that a customer has to spend in the queue **(3 marks)**

(ii) Fluctuation of the queue length **(2 marks)**

(iii) Probability that there is at least 5 customers in the system **(2 marks)**

(iv) Percentage of time the barber is idle is 8 hours **(3 marks)**