TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY
(BSIT 11M)

ICS 2307: SIMULATION & MODELLING

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
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** 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) Explain the benefits and limitations of simulation **(10 marks)**

b) Briefly discuss any FIVE areas where simulation can be applied **(10 marks)**

c) Briefly explain the steps followed in simulation and modeling   **(10 marks)**

Question Two

a) State SIX simulation softwares and their applications   **(6 marks)**

b) Explain the following queuing system characteristics   **(6 marks)**
  (i)   Annual process
  (ii) Quear behavior
  (iii) System capacity

c) Briefly explain any TWO methods used in random number generation   **(6 marks)**

d) Explain the importance of generating random numbers in a simulation study.   **(2 marks)**

Question Three

a) A shoe place employs 3 persons who can on average each prepare the heads of 5 pairs of shoes an hour. If the average number of customers requiring services is 10 per hour calculate the traffic intensity.   **(4 marks)**

b) Suppose customers queue to use an ATM at an interval of 3 minutes exponentially distributed and spends an average of 24 minutes. Calculate the following performance measures.
  (i)   Annual rate   **(3 marks)**
  (ii) Service rate   **(3 marks)**
  (iii) Traffic intensity   **(2 marks)**
  (iv) Expected number in system   **(4 marks)**
  (v)   Expected number in the queue   **(4 marks)**

Question Four

a) The manager of company A is considering the proposal to take over company B based on the following observation, Company B estates the probability distribution of cost and revenues of the takeover proposal as under:

Cost per day	Probability	Cost per day	Probability
Kshs		Kshs	
18,000	0.15	20,000	0.25
20,000	0.25	25,000	0.25
35,000	0.25	45,000	0.25
45,000	0.35	70,000	0.25

Using the following random number, simulate the cost and revenue for 10ms to obtain the probability distribution of net revenue to company A, if it takes over Company B.

Random number for cost
40, 12, 82, 65, 74, 92, 47, 60, 61, 62
Random number for revenue
12, 98, 31, 86, 87, 38, 88, 19, 09, 44

Question Five

a) Consider a workshop with just 2 matches A and B. Suppose that the time taken to complete a job on these 2 machines depends on the size of the job. The job time are as follows:

Machine A: (batch size/50+1) days
Machine B: (batch size/50+1) days

Suppose the workshop only takes on jobs that must be processed on machine and that each job first pass through machine A as a complete batch and then though machine B as a complete batch. The workshop expects to receive 4 orders as shown below:

Job No	Batch Size	Day Order Expected
P	200	1
Q	400	8
R	100	14
S	200	18

Required:

Use event scheduling approach to determine the number of days that the final batch will be completed:

b) Emergency cases are independently at random. Assume arrivals follow a poison input process and that the time spent with the ER doctor is exponentially distributed. Average Annual Rate = 1 patient every ½ hours
service rate = 2 patients/hour
Required
  (i)   Calculate the average arrival rate
  (ii)   Average service
  (iii) Expected time in ER
  (iv)   Expected waiting time
  (v)   Probability that there are at least 2 patients waiting to see the doctor
  (vi)   Sever utilize time   **(10 marks)**