



TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN INFORMATION COMMUNICATION
TECHNOLOGY
(BSIT 111M – Y4 S1)

ICS 2307: SIMULATION & MODELLING

END OF SEMESTER EXAMINATION

SERIES: APRIL 2014

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) 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 application. **(6 marks)**
- b) Explain the following queuing system characteristics: **(6 marks)**
- (i) Arrival process
 - (ii) Queue behavior
 - (iii) System capacity
- c) Explain any TWO methods used in random number generations **(6 marks)**
- d) Explain the importance of generating random number in a simulation study. **(2 marks)**

Question Three

- a) A shoe place employs 3 persons who can on average each repair the needs of 5 pairs of shoes an hour. If the average number of customers requiring service is 10 per hour, calculate the traffic intensity. **(4 marks)**
- b) Suppose customers have to use an ATM at an interval of 3 minutes exponentially distributed and spends an average of 2.4 minutes. Calculate the following performance measures: **(3 marks)**
- (i) Arrival rate **(3 marks)**
 - (ii) Service rate **(3 marks)**
 - (iii) Traffic intensity **(2 marks)**
 - (iv) Expected number in the system **(4 marks)**
 - (v) Expected number in the queue **(4 marks)**

Question Four

A sales man arranged to make a call each day for the next 10 working day previous experience showed that each arranged call had a 10 (%). Chance of cancellation when a call was made the expected chances of success in making sales are as shown below:

| Result | % |
|--------------|----|
| No sales | 50 |
| 1 Unit sold | 10 |
| 2 Unit sold | 30 |
| 3 Units Sold | 10 |

At the start of the 10 day period, he assured that 5 units were in stock and a further 5 would be available to dispatch orders on the same day they were placed. However, if no stock were available order would be held until the next delivery of stock.

Required:

Use a tabular simulation to cover 10 days. Show whether each call was and its results. Show also the level of stock held at the end of each day. Use the following random numbers:

5, 4, 5, 6, 2, 9, 3, 0, 3, 9, 3, 4, 8, 4, 9, 8, 4

Question Five

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

Machines A: (batch size/50 + 1) day

Machine B: (batch size/100 + 3) day

Suppose the workshop only takes on jobs that must be processed on machines and that each job must first pass through machine A as a complete batch & then through machine B as a complete batch. The job 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. **(10 marks)**

- b) Emergency cases arrive independently at random. Assume arrivals follow a Poisson input process (exponential interval times) & that the time spent with the ER doctor is exponentially distributed.

Average Annual rate = 1 patient every ½ hour. Service rate = 2 patients/hour

Required: Calculate the average arrival rate