ELIZADE UNIVERSITY

ILARA-MOKIN

FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
2nd SEMESTER EXAMINATION
2015 / 2016 ACADEMIC SESSION

COURSE CODE: CSC 410

COURSE TITLE: Computer Simulation and Modelling

COURSE LEADER: Mr. E.F. Ayetiran

DURATION: 2 ½ Hours

HOD's SIGNATURE

INSTRUCTION:

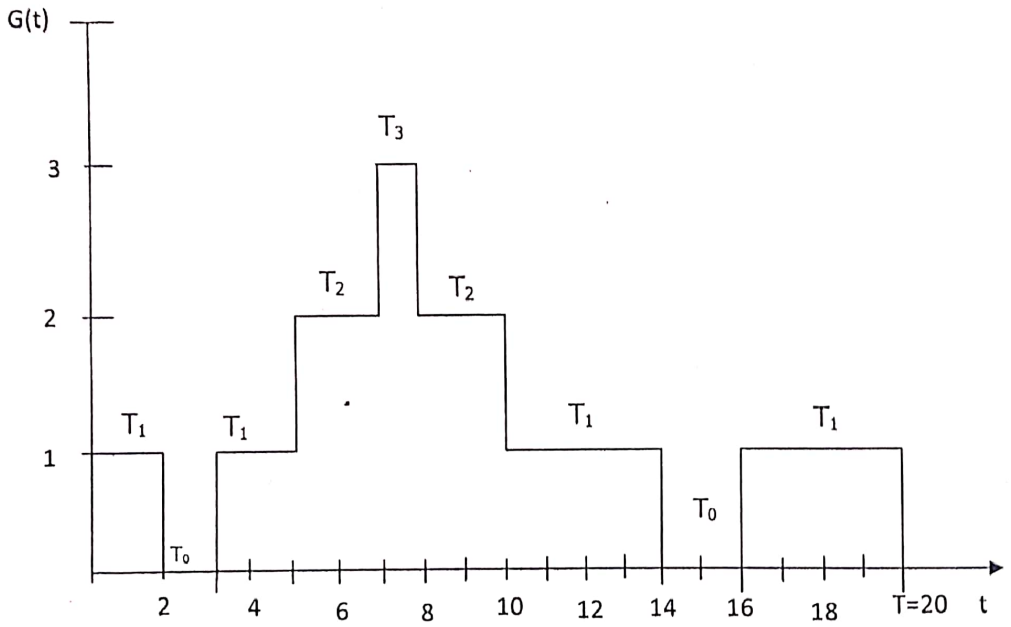
The paper will contain SIX Questions. You should answer Question 1 and any other THREE Questions. For each Question 15 marks are available. There are 60 marks in total for the exam paper; each question will be marked out of 15. The exam paper is worth 60% of the overall mark for **COMPUTER SIMULATION AND MODELLING.**

Students are warned that possession of any unauthorized materials in an examination is a serious offence

1. Consider a single-server queueing system in which customers/processes arrive at the service station at random points in time seeking service. Assuming the service discipline is FIFO, produce a model of this scenario using appropriate parameters and simulate accordingly taking a choice programming language from either C/C++, Python or Java, read a data file in which the first column indicate the arrival and the second column the service time to compute the average wait time, average inter-arrival time, average service time and average delay. **(15 marks)**

2. (a) With the aid of appropriate flowchart, describe the organization and main components of a discrete event simulation model **(15 marks)**

3. Consider a single server queueing model implementing FIFO service discipline be below:



(a) i. Describe what the model variables are all about **(3 marks)**

ii. Assume that the system implements a FIFO queue discipline, calculate the average time spent in system per customer/process (in minutes) **(3 marks)**

iii. Calculate the time-average number in system **(3 marks)**

(b) In the context of modelling and simulation, what is a system? **(3 marks)**

(c) Differentiate between discrete and continuous systems **(3 marks)**

4. (a) Briefly explain any three queueing discipline. **(3 marks)**

(b) State the properties of random numbers. Express formally the expected value and variance of each random number. **(4 marks)**

(c) Customers arrive at random to a bureau de change at a rate of $\lambda = 80$ customers per hour. Currently, there are 15-clerks, each serving $\mu = 5$ customers per hour on the average. In a steady state, calculate the average server(s) utilization. **(4 marks)**

(d) Explain the approaches to simulation clock advancement in discrete-event simulation. **(4 marks)**

5. (a) Describe the linear congruential method of random number generation **(3 marks)**

(b) Use the linear congruential method to generate a sequence of random numbers with: $x_0 = 21$, $a = 13$, $c = 35$, and $m = 200$. Terminate the generation after five iterations **(6 marks)**

(c) Modify (b) above to generate random numbers between 0 and 1. Terminate the generation after five iterations **(6 marks)**

6. (a) Explain 4 areas of simulation application **(10 marks)**

(b) State Little's law (**2 marks)**

(c) Differentiate between static and dynamic simulation models (**3 marks)**