UNIT CODE: KBI 2301
UNIT TITLE: COMPUTER MODELLING OF DECISIONS

QUESTION ONE (30 MARKS

a) By giving the characteristics of each, differentiate among the following; **(8 Marks)**
   i. Continuous-time System and Discrete-time System
   ii. Quantized variable System and Non-Quantized variable System
b) Explain the concept of Uniform Pseudo-Random Number Generation **(4 Marks)**
c) Using an example, explain how the Kolmogorov-Smirnov test is designed to test the hypothesis of any given data set **(5 Marks)**
d) Given density function f(x) = 2x, 0 £ x £ 1, generate random variates of x **(5 Marks)**
e) List two assumptions of a random variate generation algorithm (for real numbers) **(2 Marks)**
f) What are the main Variance Reduction Techniques? **(4 Marks)**
g) Explain the Linear congruential generator (LCG) **(2 Marks)**

QUESTION TWO (20 MARKS)

a) Explain the following recurrence relation; **(5 Marks)**

$$X_{n+1} = (aX_n + c) \mod m$$

b) Explain the Monte Carlo Simulation **(5 Marks)**
c) Describe the steps involved in the construction of a simulation model **(10 Marks)**

QUESTION THREE (20 MARKS)

a) Given three coins, show that the probability of getting "heads" twice during their tosses is 3/8. **(7 Marks)**
b) Given simulation problem, say the development of a robust school system explain chronologically how you would progress with the simulation study beginning from the identified problem. **(7 Marks)**
c) From the above discussion, draw a chart showing the steps followed from the problem identification up-to implementation **(6 Marks)**

QUESTION FOUR (20 MARKS)

a) Explain the following code taken from Simulation using GPSS whose aim is to simulate one day of operation of a barber shop. **(10 Marks)**

```
SIMULATE ; Define model
*
* Model segment 1
```

```
*
GENERATE 18,6 ; Customer arrive every 18±6 mn
QUEUE Chairs ; Enter the line
SEIZE Joe ; Capture the barber
DEPART Chairs ; Leave the line
ADVANCE 16,4 ; Get a hair cut in 16±4 mn
RELEASE Joe ; Free the barber
TERMINATE ; Leave the shop
*
* Model segment 2
*
GENERATE 480 ; Timer arrives at time = 480 mn
TERMINATE 1 ; Shut off the run
*
* Control cards
*
START 1 ; Start one run
END ; End model
```

b) Given simulation problem, say the development of a robust school system explain chronologically how you would progress with the simulation study beginning from the identified problem. **(10 Marks)**

QUESTION FIVE (20 MARKS)

a) Using an example, explain the Distribution of request inter-arrival times. **(7 Marks)**

b) Give a detailed explanation for the advantages and disadvantages of simulation. **(8 Marks)**

c) With a chart briefly explain the steps followed from the problem identification up-to implementation. **(5 Marks)**