MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2018/2019 ACADEMIC YEAR

SECOND YEAR **SECOND** SEMESTER EXAMINATION FOR, BACHELOR OF SCIENCE APPLIED STATISTICS

AMS 306 – STATISTICAL COMPUTING II

DURATION: 2 HOURS

DATE: APRIL 2019

TIME:

Instructions to candidates:

1. Answer question One and Any Other Two questions
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

a) Differentiate between the following terms as used in R programming language.

i. Floor and ceiling (1mark)

ii. A data frame and a list (1mark)

iii. A numeric and complex mode (1mark)

b) Discuss three types of looping in R (3marks)

c) Discuss the Monte Carlo optimization technique (5marks)

d) Differentiate between deterministic and stochastic approaches to optimization. (2marks)

e) State the use of the following functions in R;

i) > is.matrix (1mark)

ii) > round (1 mark)

iii) > scan (1 mark)

f) Describe the Monte Carlo algorithm (3marks)

g) State the use of the function "set seed" in R (1mark)

h) Discuss the accept-reject algorithm for general random numbers and write its general form (5 marks).

i) Explain each of the following lines in an R code. (5marks)

```
> u=runif(1)*M
> y=randg(1)
>while(in>f(y)/g(y))
>{
>runif(1)*M
>y=randg(1)
>}
```

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

a) Write an R code that generates each of the following and displays the output.

i) 100 random values from the uniform distribution in the interval (2,5) (2marks)

ii) 3 random values from the gamma distribution 100 with α =2.5 and β = 4.5 (2marks)

iii) 100 random values from standard normal (2marks)

b) The syntax below shows an R code. Describe each of the following lines and state the expected output (7marks)

```
> Nsim=10^4
> X=runif(Nsim)
>X1=x[-Nsim]
>X2=x[,-1]
>par(mfrow=c(1,3))
>hist(X)
>plot(X1,X2)
>acf(X)
```

c) Describe the general transformation method in R. (3 marks)

d) Write an code that uses the general transformation method to generate random numbers from the exp (1) distribution (4marks)

QUESTION THREE (20 MARKS)

a) Write down the general form of distribution code in R . (2marks)

b) You are given two matrices

$$\begin{matrix} 6 & 4 \\ 3 & 1 \end{matrix} \quad \text{and} \quad \begin{matrix} 15 & 7 \\ 1 & 9 \end{matrix}$$

i) Write an R code that can generate the two matrices 4marks

ii) What would be the output of each of the following matrix operations

a) A%*% t(B) (2marks)

b) A*B (1mark)

c) A [,2] (1mark)

d) rbind (A, B) (2marks)

e) Apply (A, 1, sum) (2marks)

f) As. matrix (1:4) (1mark)

c) Write R codes for the following operations

i) Calculating correlation (1mark)

ii) Fitting a non-linear mode (2marks)

iii) Carry out a t-test (1 mark)

iv) Carrying out ANOVA analysis (1 mark)

QUESTION FOUR (20 MARKS)

a) You observe excel data stored in the local disk D of Caro's computer in the desktop. The data is labelled price and time. Write the R code you would use to perform each of the following:

i) Read the data in R with the associated headers and label it X . (3marks)

ii) Select column for prices only (1mark)

iii) Plot a scatter plot for prices (1mark)

iv) Draw a line graph for prices against time and with labelled axes (3marks)

v) Calculate mean and standard deviation of prices (2marks)

vi) Fit a line regression line for prices and time and displays the output (3marks)

c) Describe the following operations in R

i) > solve (1mark)

ii) > correspond (1mark)

iii) >%*% (1mark)

iv) >apply (1mark)

c) State the codes for displaying the following graphics

i) Histogram (1mark)

ii) Pie chart (1mark)

iii) Stem and leaf chart (1mark)