JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE
UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE ACTUARIAL

4th YEAR 1st SEMESTER 2018/2019 ACADEMIC YEAR

MAIN REGULAR

COURSE CODE: SAS 401

COURSE TITLE: FURTHER DISTRIBUTION THEORY

EXAM VENUE: **STREAM: (Bsc. Actuarial Science)**

DATE: **EXAM SESSION: SEP-DEC 2018**

TIME: 2.00 HOURS

Instructions:

(i) Answer questions one and any other two.

(ii) Candidates are advised not to write on the question paper.

(iii) Candidates must hand in their answer booklets to the invigilator while in the examination room.

Question One (20 mks)

a) A car dealer knows from experience that out of 20 vehicles sold, 15% will have insignificant defects, 60% will be fairly damaged and 25% will have severe defects. He wants to determine the probability that out of 20 Vehicles

i) A maximum of 8 will be severely damaged (Hint: p=0.25) (4 mks)

ii) At least 12 will have moderate defects (Hint: p=0.6) (4 mks)

b) Consider the data in the table below

	Number of group Members in a Committee		
Gender	Nominated	Non nominated	
Male	x	m-x	m
Female	r-x	n-(r-x)	n
Total	r	m+n-r	m+n

i) Obtain the probability of including a given number of males in the committee p(X=x) (3 mks)

ii) Obtain E(X) (3 mks)

iii) Obtain Var(X) (3 mks)

c) Suppose

$$f(x,y) = \begin{cases} (x+y); & 0 \le x \le 1;\ 0 \le y \le 1 \\ 0; & Otherwise \end{cases}$$

Obtain

i) E(XY) (3 mks)

ii) Cov(X, Y) (3 mks)

iii) Cor(X, Y) (4 mks)

Assuming X and Y are conditionally independent

d) Let X have a density function

$$f(x) = \begin{cases} e^{-x} \; ; & x > 0 \\ 0 \; ; & Otherwise \end{cases}$$

Find the new density function of a random variable $Y=X^2$ (6 mks)

Question Two (20 mks)

Consider

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} exp\left\{-\frac{1}{2\sigma^2}(x-\mu)^2\right\}; \quad -\infty < x \infty; \; -\infty < \mu \infty$$

Use moment generating technique to obtain

i) E(X) (10 mks)
ii) Var(X) (10 mks)

Question Three (20 mks)
Suppose that a joint pdf of two random variables X and Y is as follows

$$f(x,y) = \begin{cases} c(x^2+y); & for \; 0 < y \leq (1-x^2) \\ 0; & Otherwise \end{cases}$$

Determine

a) Value of the constant c (4 mks)
b) Cov(X, Y) (4 mks)

c) Pearson cor(X, Y) (4 mks)
d) Regression equation between X and Y (4 mks)
e) Obtain coefficient of determination and interpret the fit statistic (4 mks)

Question Four (20 mks)
Describe the regression between x and y from font distribution function given by

$$f(x,y) = \begin{cases} 2xy; & 0 < y < x; \; 0 < x < 2 \\ 0; & Otherwise \end{cases}$$

Obtain

i)	Cov(X, Y)	(4 mks)
ii)	The correlation coefficient	(4 mks)
iii)	The regression equation between X and Y	(4 mks)
iv)	Interpret the regression parameters	(4 mks)
v)	Sketch a scatter diagram between X and Y including line of best fit	(4 mks)

Question Five (20 mks)

Let $X_{1,}X_{2,} \ldots \ldots \ldots .. X_{n,}$be a random variables such that $X_{i\sim}\ x^2(r_i); i = 1,2, \ldots \ldots, n$ Let each $X_{i,}$ and $X_{j,}$ be independent. Obtain joint pdf of $X_{i1,}$ and $X_{2,}$, hence of

$$f = \frac{x_1/r_1}{x_2/r_2} \qquad \{0 < x_i < \infty \qquad \forall \qquad i = 1, \cdots, n\}$$