UNIVERSITY OF SWAZILAND
SUPPLEMENTARY/RE-SIT EXAMINATION PAPER 2017/2018

TITLE OF PAPER: BIOSTATISTICS

COURSE CODE: B305/BIO301

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS: 1.   QUESTION 1 IN SECTION A IS COMPULSORY AND IT CARRIES 50 MARKS.

2.   ANSWER **ANY TWO** QUESTIONS IN SECTION B

2.   EACH QUESTION IN SECTION B CARRIES TWENTY FIVE (25) MARKS.

3.   ILLUSTRATE YOUR ANSWERS WITH LARGE AND CLEARLY LABELED DIAGRAMS WHERE APPROPRIATE.

4.   CLEARLY STATE YOUR NULL AND ALTERNATIVE HYPOTHESES AND YOUR CONCLUSIONS WHERE APPROPRIATE.

5.   SHOW ALL WORKING WHERE APPLICABLE.

SPECIAL REQUIREMENTS:

1.   CALCULATORS (CANDIDATES MUST BRING OWN).

2.   GRAPH PAPER.

3.   STATISTICAL TABLES (TO BE SUPPLIED BY THE INSTRUCTOR).

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATORS

SECTION A (Compulsory)

Question 1

(a)   Explain the difference between an α-value and a p-value.   (5 marks)

(b)   Given below is a frequency table of number of successes of a cohort of 365
        Police dogs to identify a bag with Cocaine.

No. of Successes	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Frequency	265	49	21	19	10	10	2	2	4	2	1	4	3	1	2

Calculate the following
(i) mean,   (5 marks)
(ii) standard deviation,   (5 marks)
(iii) 99% confidence interval of the mean   (5 marks)

(c)·   Swaziland Defence Force has recently placed an upper limit on the height of
        its recruit soldiers on the assumption that people who are too tall stand out in
        the bush, making them a liability to others in the face of an enemy. To apply to
        be a soldier, one must not be taller than 180.3 cm (if you are a man) or 172.7
        cm (if you are a woman). The mean height of Swazi women is 163.3 with
        standard deviation of 6.4 cm and the mean height of Swazi men is 177.0 cm
        with a standard deviation of 7.1 cm. Estimate the proportion of Swazi women
        that qualify to be soldiers.   (5 marks)

(d)   If probability of meeting a snake in the forest is 0.8, determine the probability
        of meeting a snake six times in a total to 12 visits to the forest.   (5 marks)

(e)   Twenty dental patients were examined for tooth decay. The frequency of the
        number of patients with a given number of decayed teeth was as follows:

# Decayed teeth	Number of patients
0	4
1	3
2	5
3	2
4	4
5	1
6	1

Calculate the probability of finding a patient chosen at random who has 3 or
more decayed teeth.   (5 marks)

(f)   The results of a random sample of children with pain from musculoskeletal injuries treated with acetaminophen, ibuprofen, or codeine are shown in the table below.

Result	Treatment		
	Acetaminophen	Ibuprofen	Codeine
Significant improvement	58	81	61
Slight improvement	42	19	39

Using an appropriate test, determine whether there is significant relationship between treatment the result.   (15 marks)

[Total Marks = 50]

SECTION B (Answer any two questions in this section)

Question 2

(a)   Population growth of springboks per year is approximately normally distributed among game reserves in Swaziland, with mean of 1.38% and standard deviation equal to 1.2%. Determine the fraction of game reserves that have a positive (greater than 0) population growth rate.   (5 marks)

(b)   A random sample of 200 elephants has a mean trunk length of 1.5 m and standard deviation of 0.255 m. Calculate the 95% confidence interval for the mean length of elephant trunks.   (5 marks)

(c)   A researcher asked several smokers how many cigarettes they had smoked the previous day. Here are the data.

Men	2	2	5	6	8	16
Women	4	7	20	20		

Given that these data are not normally distributed, investigate whether there is a significant difference in number of cigarettes smoked per day between men and women.   (15 marks)

[Total Marks = 25 marks]

Question 3

Mfundo and Nomfundo studied the survival time of goldfish (in minutes) when placed in colloidal silver suspensions. They used three different treatments, which differed in the concentrations of silver and other solutes. Here's a list of the survival times:

Observation	Survival times (minutes)		
	Treatment 1	Treatment 2	Treatment 3
1	210	150	330
2	180	180	300
3	240	180	300
4	210	240	420
5	210	240	120

Given that these data are not normally distributed, investigate whether the survival times are equal in the three groups.   (25 marks)

Question 4

(a)   Discuss what constitutes a good research question, explaining how one can go about developing a good research question.   (10 marks)

b)   Explain the five basic steps that need to be followed to achieve a properly designed experiment.   (15 marks)

[Total Marks = 25 marks]

Question 5

Discuss in detail the various components of a good proposal,   (25 marks)

END OF EXAM PAPER