

UNIVERSITY OF ESWATINI
MAIN EXAMINATION PAPER 2018/2019

TITLE OF PAPER: BIostatISTICS

COURSE CODE: 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. USE CLEARLY LABELED DIAGRAMS WHERE APPROPRIATE
 4. CLEARLY STATE YOUR NULL AND ALTERNATIVE HYPOTHESES AND YOUR CONCLUSIONS WHERE APPROPRIATE
 5. SHOW ALL CALCULATIONS WHERE APPLICABLE

SPECIAL REQUIREMENTS:

1. CALCULATORS (CANDIDATES MUST BRING OWN).
2. GRAPH PAPER WILL BE SUPPLIED
3. STATISTICAL TABLES (TO BE SUPPLIED WITH THE EXAM PAPER).

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

SECTION A (Compulsory)

Question 1

(a) The marks obtained by 50 students in the Biostatistics Exam are as follows:

| Marks | No. of students |
|-------|-----------------|
| 41-50 | 5 |
| 51-60 | 18 |
| 61-70 | 15 |
| 71-80 | 7 |
| 81-90 | 5 |

- (i) Calculate the mean [3]
 (ii) Sample variance [3]
 (iii) Standard deviation [3]
 (v) Present these data in a histogram [6]

b) The speeds of vehicles along a stretch of highway are normally distributed, with a mean of 67 km/h and a standard deviation of 4 km/h. Find and plot the speeds x corresponding to z-scores of:

- (i) 1.96 [3]
 (ii) -2.33 [3]
 (iii) 0 [3]
 (IV) At which Z score is X equal to the mean? [1]

c) A survey reports that 86% of Internet users use Windows Internet Explorer[®] as their browser. If you randomly select 200 Internet users and ask whether they use Internet Explorer as their browser, what is the probability that between 173 to 176 of the cohort will say yes?

[10]

d) Describe the basic five steps that are followed in designing an experiment. [15]

[Total Marks = 50]

SECTION B (Answer any two questions in this section)**Question 2**

a) A game poacher kills on the average 3 kudus per week. Use Poisson's law to calculate the probability that in a given week he will kill:

- (i) Some kudus. [5]
 (ii) Two or more kudus but less than five kudus. [5]
 (iii) Assuming that there are five hunting days per week, what is the probability that in a given day he will kill one kudu? [5]

b) Births in a hospital occur randomly at an average rate of 1.8 births per hour.

- (i) What is the probability of observing four births in a given hour at the hospital? [5]
 (ii) What is the probability of observing more than or equal to two births in a given hour at the hospital? [5]

[TOTAL MARKS: 25].

Question 3

A plant ecologist wishes to know if the height of *species X* depends on the type of soil it grows in. She measures the height (in centimeters) of three plants in each of four plots representing four different soil types. The results are tabulated below.

| Observation | Height (centimeters) | | | |
|-------------|----------------------|--------|--------|--------|
| | Plot 1 | Plot 2 | Plot 3 | Plot 4 |
| 1 | 15 | 25 | 17 | 10 |
| 2 | 9 | 21 | 23 | 13 |
| 3 | 4 | 19 | 20 | 16 |

Assuming normality and equality of variances state a suitable null hypothesis and test its validity. Note if you reject the null hypothesis, apply a suitable multiple comparison test to the locate source of the difference(s), if any.

[TOTAL MARKS: 25].

Question 4

(a) Define a Type I error and explain the relationship between a Type I error and the significance level of a hypothesis test. [5 marks]

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

(c) A random sample of 200 elephants has a mean trunk length of 1.5 meters. Trunk length is normally distributed, and 95% of the elephants in the sample have trunks between 1.0 and 2.0 meters. Using the information from this sample, calculate the 95% confidence interval for the mean length of elephant trunks.

(SD = 0.255 & $t_{\alpha, 0.05, 200} \approx 2$)

[5 marks]

(d) Researchers tabulated how many cigarettes smokers they had smoked the previous day.

| | | | | | | |
|-------|---|---|----|----|---|----|
| Men | 2 | 2 | 5 | 6 | 8 | 16 |
| Women | 4 | 7 | 20 | 20 | 0 | 0 |

Given that the distribution of these data is not normal, determine whether there is a difference in the number of cigarettes smoked per day between men and women. [10 Marks].

[TOTAL MARKS: 25]

Question 5

Discuss in detail the essential components of a research proposal.

[TOTAL MARKS: 25]

[TOTAL MARKS: 50]

END OF EXAM PAPER