****

**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE & TECHNOLOGY**

**SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES**

**DEPARTMENT OF BIOLOGICAL SCIENCES**

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN BIOLOGICAL SCIENCES**

**3RD YEAR 2ND SEMESTER 2016/2017 ACADEMIC YEAR**

**MAIN CAMPUS - REGULAR**

**COURSE CODE: SBI 3326**

**COURSE TITLE: BIOSTATISTICS I**

**EXAM VENUE: BIO LAB STREAM: (BIO)**

**DATE: 26/04/17 EXAM SESSION: 2.00 – 4.00 PM**

**TIME: 2 HOURS**

**Instructions:**

1. **Answer ALL questions in Section A and Any two questions in Section B**
2. **Candidates are advised not to write on question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

**SECTION A: SHORT ANSWER QUESTIONS(30 MARKS)**

1. Describe the following data types:
   1. Discrete data. (1 mark)
   2. Categorical data. (1 mark)
   3. Ordinal data. (1 mark)
2. Describe the following graphical data summary techniques:
   1. Stem and leaf plots. (1 mark)
   2. Scatter plots. (1 mark)
   3. Histograms. (1 mark)
3. Make a distinction between positively and negatively skewed datasets. (3 marks)
4. Distinguish between cluster sampling and stratified sampling techniques. (3 marks)
5. The data set below gives that birth weight of children in a rural health facility.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2.54 | 3.20 | 3.49 | 3.80 | 2.83 | 3.27 | 3.03 | 3.83 | 3.62 | 3.27 |
| 3.98 | 3.61 | 2.54 | 3.04 | 3.47 | 3.21 | 3.09 | 2.68 | 2.78 | 3.79 |

Calculate the

* 1. Mean. (1 mark)
  2. Variance. (1 mark)
  3. Standard deviation. (1 mark)

1. Determine the 95% confidence interval of the data provided in question 4. (3 marks)
2. Explain the relationship between biological and statistical null hypotheses. (3 marks)
3. A researcher claims that the average economic burden of malaria in Siaya County is less than KShs. 8000. He selects a random sample of 36 patients and finds a mean of KShs 6500 ans a standard deviation of 1920. Is there enough evidence to support the researcher’s claims? Use α = 0.10
4. Describe the three different types of *t* tests. (3 marks)
5. State the assumptions of parametric statistics. (3 marks)

**SECTION B: ESSAY QUESTIONS (40 MARKS)**

1. A postgraduate student at JOOUST compared the efficacy of a plant extract in controlling mosquitoes against a conventional indoor residual spray (IRS) in Vihiga County. She designed an experiment in which 20mud-walled, grass-thatched houses were sprayed with the conventional IRS and another 20 similar houses were sprayed with a formulation consisting of the plant extract. Each house was sprayed with the designated insecticide and after 4 days, mosquitoes were collected from the houses using a backpack aspirator.The collected mosquitoes were counted and recorded in the data set given below: Use the data to determine whether there was a difference in the efficacy of the two insecticides. Set the confidence level at 95%. (20 marks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Plant Extract | 19 | 17 | 23 | 20 | 18 | 16 | 22 | 25 | 20 | 21 | 15 | 19 | 17 | 16 | 18 | 21 | 19 | 16 | 18 | 19 |
| Conventional IRS | 13 | 8 | 13 | 11 | 9 | 13 | 14 | 8 | 10 | 14 | 14 | 10 | 14 | 14 | 12 | 12 | 15 | 12 | 12 | 13 |

1. The data below is of genome size (picograms of DNA per haploid cell) of 10 randomly selected species from four families of insects. Perform a statistical test at 95% confidence level to determine whether genome sizes in the four families are similar. (20 marks)

|  |  |  |  |
| --- | --- | --- | --- |
| **Chrysomelidae** | **Culicidae** | **Aphididae** | **Apidae** |
| 0.93 | 0.97 | 0.31 | 0.19 |
| 1.02 | 0.97 | 0.39 | 0.17 |
| 0.71 | 0.94 | 0.49 | 0.24 |
| 0.89 | 0.73 | 0.48 | 0.35 |
| 3.69 | 1.44 | 0.60 | 0.34 |
| 1.07 | 1.52 | 0.18 | 0.47 |
| 0.40 | 0.24 | 0.89 | 0.42 |
| 0.91 | 0.29 | 0.51 | 0.68 |
| 1.18 | 0.27 | 0.40 | 0.52 |
| 0.90 | 1.12 | 0.66 | 0.69 |

1. A scientist crossed clearfield rice, which are resistant to the herbicide imazethapyr, with red rice, which are susceptible to imazethapyr. They then crossed the hybrid offspring and examined the F2 generation, where they found 772 resistant plants, 1611 moderately resistant plants, and 737 susceptible plants. Perform a statistical test to determine if the observed ratio was in harmony with the expected ration of 1:2:1. Set your confidence level at 95%. (20 marks)
2. A common observation in ecology is that species diversity decreases as you get further from the equator. Data on the count of all the birds in a 15-mile diameter area during one winter day was recorded from 10 locations. Using the provided data, test whether this pattern could be seen on a small scale. Set your confidence level at 95%. (20 marks)

|  |  |
| --- | --- |
| **Latitude** | **No. of species** |
| 39.2 | 128 |
| 38.8 | 137 |
| 39.5 | 108 |
| 39.0 | 118 |
| 38.6 | 135 |
| 38.6 | 94 |
| 39.7 | 113 |
| 38.0 | 118 |
| 38.9 | 96 |
| 39.5 | 98 |
| 39.1 | 121 |
| 38.3 | 152 |
| 38.3 | 108 |
| 38.4 | 118 |
| 37.2 | 157 |