**MOUNT KENYA UNIVERSITY**

Faculty of Applied and Health Sciences

Department of ENVIROMENT & Health Sciences

**UNIVERSITY EXAMINATION FOR:** Bachelor of EDUCATION ARTS (BEDA)/ Bachelor of EDUCATION SCIENCE (BEDSC)

 BMA 3116: BIOSTATISTICS

END OF SEMESTER EXAMINATION

**SERIES:AUG-DEC 2017**

**TIME:**2HOURS**E:**Pick DateSelect MonthPick Year

**Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of five questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

**Question ONE (30 MARKS)**

a). Describe the properties of the arithmetic mean (**4 marks**)

b). Describe conditional probability (**4 marks**)

c). Outline the properties of Sampling Distribution of a (sample mean) when sampling is from a normally distributed population. (**4 marks**)

d). Four subjects participated in an experiment to compare three methods of relieving stress. Each subject was placed in a stressful situation on three different occasions. Each time a different method for reducing stress was used with the subject. The response variable is the amount of decrease in stress level as measured before and after treatment application. The results were as follows:

 **Treatment**

**Subject A B C**

1 16 26 22

2 16 20 23

3 17 21 22

4 28 29 36

Can we conclude from these data that the three methods differ in effectiveness? Let α = .05.

 (**4 marks**)

e). Differentiate between simple random sampling and stratified random sampling (**6 marks**)

f). Outline the properties of probability (**4 marks**)

g). Outline sources of Data in biostatistics (**4 marks**)

**Question TWO (20 MARKS)**

a). Differentiate between the following variables (give an example of each).

i) Discrete vs. Continuous variable

ii) Nominal vs. Ordinal variable

(**4 marks**)

b). The data below shows gender attendance at two universities (i.e. Technical University of Mombasa and Technical University of Kenya) for students pursuing Bachelor of Marine and Resource Management.

|  |  |  |  |
| --- | --- | --- | --- |
|  | TUM | TUK | Total |
| Female | 38 | 7 | 45 |
| Male | 46 | 9 | 55 |
| Total | 84 | 16 | 100 |

Using chi-square test statistic to test the relationship between gender and university type

(**16 marks**)

**Question Three (20 mks)**

(a) Potassium blood levels in healthy humans are normally distributed with a mean of 17.0 mg/100 ml, and standard deviation of 1.0 mg/100 ml. Elevated levels of potassium indicate an electrolyte balance problem, such as may be caused by Addison’s disease. However, test for potassium level should not cause too many “false positives”.

1. What is the probability that Potassium blood levels in healthy humans is greater than 20.0 mg/100 ml?  **(3 mks)**
2. What is the probability that Potassium blood levels in healthy humans is less than 16.0 mg/100 ml? **(3 mks)**
3. What level of potassium should we use so that only 2.5 % of healthy individuals are classified as “abnormally high”? **(3 mks)**

**(b)** Executives in the New Zealand Forestry Industry claim that only 5% of all old sawmills sites contain soil residuals of dioxin (an additive previously used for anti-sap-stain treatment in wood) higher than the recommended level. If Environment Canterbury randomly selects 20 old saw mill sites for inspection, assuming that the executive claim is correct

1. Calculate the probability that less than 1 site exceeds the recommended level of dioxin **(3 mks)**
2. Calculate the probability that less than or equal to 1 site exceed the recommended level of dioxin. **(3 mks)**
3. Calculate the probability that at most (i.e., maximum of) 2 sites exceed the recommended level of dioxin **(3 mks)**

(d) Differentiate between primary data and secondary data **(2 mks)**

**Question Four (20 mks)**

The table below summarizes bed capacities of some hospitals in Nairobi.

|  |  |
| --- | --- |
| Bed capacity | Number of hospitals |
| 0-19 | 2 |
| 20-39 | 2 |
| 40-59 | 7 |
| 60-79 | 5 |
| 80-99 | 4 |

Using the above calculate:

1. Mean  **(4 mks)**
2. Median **(3mks)**
3. Mode **(3 mks)**
4. Standard deviation **(5 mks)**
5. 80th percentile **(3 mks)**
6. Find the pearson’s coefficient of variation **(2 mks)**

**Question Five (20 mks)**

1. State and explain any three sources of primary data **(6mks)**
2. State any three types of variables **(3 mks)**
3. A biologist assumes that there is liner relationship between the amount of fertilizer applied to tomato plants and the subsequent yield of tomatoes obtained. Eight tomato plants of the same variety was selected at random and treated weekly, with a solution in which X grams of fertilizer was dissolved in a fixed quantity of water. The yield Y kilograms of yield was recorded.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Plant | A | B | C | D | E | F | G | H |
| X | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4 | 4.5 |
| Y | 3.9 | 4.4 | 5.8 | 6.6 | 7.0 | 7.1 | 7.3 | 7.7 |

1. Plot a scatter diagram of the yield Y, against amount of fertilizer, X **(3mks)**
2. Construct a linear regression model between Y and X **(6 mks)**
3. Estimate the yield of a plant treated weekly with 3.2 grams of fertilizer **(2 mks)**