**AMREF INTERNATIONAL UNIVERSITY**

**SCHOOL OF PUBLIC HEALTH**

**DEPARTMENT OF HEALTH SYSTEMS MANAGEMENT AND DEVELOPMENT**

**BACHELOR OF SCIENCE IN HEALTH SYSTEMS MANAGEMENT AND DEVELOPMENT**

**END OF SECOND SEMESTER EXAMINATION MAY-AUGUST 2024**

**HMD 133 INTRODUCTION TO BIOSTATISTICS**

**TIME:**       Two Hours

 **Date   :**

**TIME :**               Two (2) Hours          Start----------------------End…………………

**INSTRUCTIONS TO CANDIDATES**

1) This exam is out of 70 marks
2) Section-A is compulsory with a Total of 30 Marks
3) Answer any TWO (2) questions in Section B

*Read carefully the additional instructions preceding each section.*

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**INSTRUCTIONS:** Answer Question **ONE** and any other **TWO** Questions.

**Question one (30 Mks)**

1) Distinguish by giving examples in Health systems.
   - i)     Null and Alternative Hypothesis                              (3mks)
   - ii)    Discrete and continuous variables                            (3mks)
   - iii)   Observation and Subject                                      (3mks)
   - iv)    Parameter and Statistic                                      (3mks)

2)



(a) The weights, in kilograms, of the 8 members of *Hereward House* tug of war team **(Left)** at a school sports are:

$$75, \ 73, \ 77, \ 76, 84, \ 76, \ 77, \ 78.$$

   - i)      Calculate the mean weight of the team.                       (3mks)
   - ii)     Compute the variance, Standard deviation and CoV            (6mks)
   - iii)    Compute the median and mode                                 (4mks)
   - iv)     Calculate the range                                          (2mks)

(b) The 8 members of *Nelson House* tug of war team **(Right)** have a mean weight of **64** kilograms.
   - i)      Which team do you think will win a tug of war between *Hereward House* and *Nelson House*?  Give a reason for your answer.          (3mks)

**Question Two (20 Mks)**

1) The following table shows hemoglobin levels for miners, compute the probabilities described below.

| Class Interval for Hemoglobin | Number of miners |
|-------------------------------|------------------|
| 12.0–17.9                     | 24               |
| 18.0–21.9                     | 53               |
| 22.0–27.9                     | 13               |
| Total                         | 90               |

Source : Adapted from Dunn, O J (1977). Basic Statistics :A primer for the Biomedical science , 2nd Edition . Wiley , New York, p.17,

a. Compute the probability that a miner selected at random from the population has:
   i) a hemoglobin level in the 12.0–17.9 range.  (3mks)
   ii) a hemoglobin level in the 18.0–21.9 range.  (3mks)
   iii) a hemoglobin level in the 22.0–27.9 range.  (3mks)

2) During a study, data on the following variables was collected for each patient in a hospital ward (see table). For each of the following variables, state whether it is qualitative or quantitative **(type)**; hence further classify into either nominal, ordinal, discrete or continuous **(sub type)**.
   (11mks)

| Variable | Type | Sub type |
|---|---|---|
| Exact age of a patient (in years) | | |
| Weight (in grams) | | |
| Height (in meters) | | |
| Systolic blood pressure | | |
| Blood type | | |
| Sickness description | | |
| Smoking (Yes or No) | | |

**Question Three (20 Mks)**

A manager provided you with an SPSS output for sample data for workplace study on back pain. The manager wanted to know whether Job stressfulness is associated with the Lower Back pain (LBP). Below is the output.

**Lower Back pain * is your job stressful? Crosstabulation**

| | | | Is your job stressful? | | Total |
| | | | stress free | stressful | |
|---|---|---|---|---|---|
| Lower Back pain | NoLBP | Count | 96 | 44 | 140 |
| | | % within Lower Back pain | 68.6 | 31.4 | 100.0% |
| | | % within Is your job stressful? | 73.8% | 54.3% | 66.4% |
| | LBP | Count | 34 | 37 | 71 |
| | | % within Lower Back pain | 47.9% | 52.1% | 100.0% |
| | | % within Is your job stressful? | 26.2% | 45.7% | 33.6% |
| Total | | Count | 130 | 81 | 211 |
| | | % within Lower Back pain | 61.6 | 38.4% | 100.0% |
| | | % within Is your job stressful? | 100.0% | 100.0% | 100.0% |

**Chi-Square Tests**

| | Value | df | Asymp. Sig. (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|
| Pearson Chi-Square | 8.521[b] | 1 | .004 | | |
| Continuity Correction[a] | 7.669 | 1 | .006 | | |
| Likelihood Ratio | 8.428 | 1 | .004 | | |
| Fisher's Exact Test | | | | .004 | .003 |
| Linear-by-Linear Association | 8.481 | 1 | .004 | | |
| N of Valid Cases | 211 | | | | |

## Case Processing Summary

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Valid | | Missing | | Total | |
| | N | Percent | N | Percent | N | Percent |
| Lower Back pain * Is your job stressful? | 211 | 79.0% | 56 | 21.0% | 267 | 100.0% |

i)   State the hypothesis                                                                        (4mks)
ii)  What was the sample size?                                                                   (2mks)
iii) Which stress category is greatly affected by the LBP?                                       (2mks)
iv)  Which stress category is least affected by LBP?                                             (2mks)
v)   Why was the Chi square test appropriate in this case?                                       (4mks)
vi)  Was there a statistical difference between stressful job status
     and Lower Back Pain, Justify?                                                               (6mks)

## Question Four  (20 Mks)

1) Denzel and Cherie are patients who often go to physiotherapy treatment . on such a visit there is a probability of 0.4 that Denze will purchase medicine prescribed . The probability that Cherie will purchase medicine prescribed is 0.7 if denzel buys medicine and 0.35 if he does not.

a)   Draw a probability tree diagram illustrating this case                      (6mks)

b) When Denzel and Cherie go for physiotherapy session together :

i. Find the probability that both will buy Medicine prescribed            (4mks)

2)Outline steps to conduct hypothesis testing illustrating using a physiotherapy example or case (4mks)

3) Thika Hospital keeps a record of the number of patients who visits the new launched Health Facility. The records are:

1, 0, 2, 0, 0, 0, 12, 0, 2, 0, 0, 1, 18, 0, 2, 0, 1.

(a) Why does the management object to talking about the mode and median of the number of patients who visit?                                                                              (4mks)
(b) Find the range                                                                               (2mks)