AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF MEDICAL SCIENCES
DEPARTMENT OF NURSING & MIDWIFERY SCIENCES
End of Semester April 2025 Examinations

COURSE CODE AND TITLE: BSM 313: Biostatistics

DATE: 7-APRIL-2025

Duration: 2 HOURS Start: 9:00 AM Finish: 11:00 AM

INSTRUCTIONS

1. This exam is out of 70 marks
2. This Examination comprises THREE Sections. Section I: Multiple Choice Questions (20 marks) Section II: Short Answer Questions (30 marks) and Section III: Long Answer Questions (20 marks)
3. Answer ALL Questions.
4. Do Not write anything on the question paper -use the back of your booklet for rough work if need be.

SECTION I: MULTIPLE CHOICE QUESTIONS (20 MARKS)

1. Gender, age-class, religion, type of disease, and blood group are measured on:
   A. Nominal scale of measurement
   B. Ordinal scale of measurement
   C. Interval scale of measurement
   D. Ratio scale of measurement
2. Prevalence of disease is :-
   A. Rate
   B. Deviation
   C. Proportion
   D. Ratio
3. The arithmetic mean possesses certain properties; they include the following except
   A. Uniqueness
   B. Simplicity
   C. It is affected by each value
   D. Specificity
4. Random sampling or probability sampling includes all the following techniques, except:
   A. Simple random sampling
   B. Stratified random Sampling
   C. Cluster sampling
   D. Purposive Sampling
5. The following are true about probability of complementary events except:
   A. The probability of an event is equal to 1 minus the probability of its complement
   B. It follows the third property of probability
   C. The event and its complement are mutually exclusive.
   D. The probability one event is dependent on the other
6. The following is true about type II error:
   A. Accepting null hypothesis while alternative hypothesis is true
   B. Accepting null hypothesis while alternative hypothesis is false
   C. Rejecting null hypothesis while alternative hypothesis is true
   D. Rejecting null hypothesis while alternative hypothesis is false
7. Large standard deviations suggest that:
   A. Scores are probably widely scattered.
   B. There is very little deference among scores.
   C. Mean, median and mode are the same
   D. The scores not normally distributed.
8. Standard error of mean indicates
   A. Dispersion
   B. Distribution
   C. Deviation
   D. Variation

9. The following is *TRUE* about research hypothesis:
   A. States there is no relationship between the variables.
   B. Statement about the expected relationship of the variables
   C. States a negative relationship between the variables
   D. Research hypothesis should always be directional.
10. The standard deviation of a sampling distribution is referred to as the:
   A. Test statistic
   B. Standard error
   C. Confidence interval
   D. Test of significance
11. A type of graph which displays the median value by a horizontal bar surrounded by 50% of scores shown within a box:
   A. Histogram
   B. Box plots
   C. Frequency polygon
   D. Normal distribution
12. A statistic which describes the interval of scores bounded by the 25th and 75th percentile ranks is:
   A. Inter quartile range
   B. Confidence Interval
   C. Standard deviation
   D. Variance
13. The formula given below is computational formula for:

$$\sqrt{\frac{\Sigma[X - \bar{X}]^2}{(n - 1)}}$$

   A. Variance
   B. Mean
   C. Standard deviation
   D. t-statistic
14. The following is not true about statistical inference
   A. It is the procedure by which we reach a conclusion about a population
   B. It is based on the information contained in a sample that has been drawn from that population.
   C. A scientific sample from the population is needed to make it
   D. You can use purposive sampling to generate sample
15. Study that is used to compare serum cholesterol levels in obese and non-obese women and to find the relation or significant prevalence is:
   A. Paired test
   B. Student t test
   C. Z-test

D. Chi-square test

16. Correlation between height and weight of children is best represented by:
    A. Bar diagram
    B. Histogram
    C. Line diagram
    D. Scatter diagram
17. Yates correction is necessary in Chi-square test when expected frequency in any one cell is:
    A. Less than 10
    B. More than 10
    C. Less than 5
    D. More than 5
18. The following is true about probability of complementary events
    A. The probability of an event is equal to 1 minus the probability of its complement
    B. It follows the third property of probability
    C. The event and its complement are mutually exclusive.
    D. The probability of one event is dependent on the other.
19. The following is true about skewness of data
    A. Distribution is symmetric
    B. When the left half and right half of the graph of a distribution are not mirror images of each other
    C. The mean, mode and median are at the same point.
    D. The mean and mode differ with median
20. Suppose that the probability of event A is the same regardless of whether or not B occurs, we say that events are
    A. Dependent
    B. Independent
    C. Conditional
    D. Joint

SECTION II: SHORT ANSWER QUESTIONS (30 marks)

1. Differentiate the following terms.
    a) Null hypothesis and alternative hypothesis (2marks)
    b) Type I error and Type II error (2marks)

2. Consider an experiment in which dissolution data have been collected on a particular formulation, yielding the following figures: 87, 109, 79, 80, 96, 95, 90, 92, 96, 98, 101, 91, 78, 112, 94, 98, 94, 107, 81, 96
    a) Construct a stem and leaf display for this data (3 marks).
    b) Comment on the shape of the stem and leaf (1 marks).

3. In the health survey of schoolchildren, it is found that the mean Hb level of 55 boys is 10.2 per 100 ml with a standard deviation of 2.1. We can consider this group as taken from a population with a mean 11.0 g/100 ml?
   a) State null hypothesis (1 mark)
   b) Calculate the Standard error of the mean (3 marks)
   c) Critical ratio (3 marks)

4. Outline five assumptions in Analysis of Variance (5 marks).

5. State three disadvantages of non-parametric tests (3 marks).

6. You believe that people who die from overdoses of narcotics die rather young. To test this theory, you have obtained the following distribution of a number of deaths from overdoses:

Age interval	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Number of deaths	40	35	32	10	13	13	4

   a) Calculate the Chi-square statistics (5 marks)

   b) Interpret the results, given that the Chi-square value at a significance of 0.05 and df of 6 is 12.592 (2 marks).

SECTION III: LONG ANSWER QUESTION (20 marks)

1. Data by Mazze et al. [1971] deal with the preoperative and postoperative creatinine-clearance (ml/min) of six patients anesthetized by halothane:

	Patient					
	1	2	3	4	5	6
Preoperative	110	101	61	73	143	118
Postoperative	149	105	162	93	143	100

   a) State null and alternative hypothesis (2 marks)
   b) Calculate the paired t-test (8 marks)
   c) Test the significance of the difference (8 marks).
   d) Interpret the results (2 marks)