



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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## University Examinations 2023/2024

SECOND YEAR, FIRST SEMESTER EXAMINATION THE DEGREE OF BACHELOR OF SCIENCE IN NURSING, SECOND YEAR, THIRD SEMESTER EXAMINATION THE DEGREE OF BACHELOR OF SCIENCE IN NURSING, SECOND YEAR, FIRST SEMESTER EXAMINATION THE DEGREE OF BACHELOR OF SCIENCE IN HEALTH SYSTEMS MANAGEMENT

### NNU 3226/NNH 320/NND 3235: INTRODUCTION TO MEDICAL BIOSTATISTICS

DATE: DECEMBER 2023

TIME: 2 HOURS

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**INSTRUCTIONS:** *Answer question one and any other two questions*

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#### QUESTION ONE (30 MARKS)

- a) Distinguish between each of the following terms as used in statistics;
- i. Point and interval estimates (2 Marks)
  - ii. Discrete and continuous random variables. (2 Marks)
  - iii. Probabilistic and non-probabilistic sampling (2 Marks)
- b) It is expected that 8% of vaccines from a continuous production line will be defective.
- c) Find the probability that in a sample of 20 vaccines chosen at random
- i. Exactly four will be defective. (2 marks)
  - ii. At least four will be defective (4 marks)
  - iii. What is the expected number of defective vaccine and the variance? (3 marks)
- d) Water samples from 35 randomly selected swimming pools were tested for acidity. The following data listed the PH for each sample:

6.4 6.6 6.2 7.2 6.2 7.0

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5.9 5.7 7.0 7.4 6.5 7.0  
 7.0 6.0 6.3 5.6 6.3 5.9  
 7.2 7.3 7.7 6.8 5.2 5.9  
 6.4 6.3 6.2 7.5 6.4 7.8

By grouping the data from 5.0-5.4, 5.5-5.9.....

- i) Construct the frequency distribution table (3 marks)
- ii) Calculate the arithmetic mean, and standard deviation (7 marks)
- iii) Present the data using Histogram and the frequency curve (4 marks)
- iv) Comment on the data distribution (1 mark)

**QUESTION TWO (20 MARKS)**

a) The weight distribution of male and female patients visiting a hospital is as follows:

	Sample size	Mean weight (kgs)	Standard deviation (Kgs)
Males	150	65.43	3.16
Females	240	73.35	5.25

- i) Determine the combined mean (2 marks)
  - ii) Determine which of the gender has more variability in weight (5 marks)
- b) Distinguish the parametric and non-parametric methods in carrying out medical research (6 marks)
- c) In a batch chemical process, two catalysts are being compared for their effect on the output of the process reaction. A sample of 12 batches is prepared using catalyst 1 and a sample of 10 batches was obtained using catalyst 2. The 12 batches for which catalyst 1 was used gave an average yield of 85 with a sample standard deviation of 4, while the average for the second sample gave an average of 81 and a sample standard deviation of 5. Find a 90% confidence interval for the difference between the population means, assuming the populations are approximately normally distributed with equal variances. (7 marks)

**QUESTION THREE (20 MARKS)**

a) The data below relates to the weights in kg of 10 female and 8 male neonates recorded in a certain clinic

Female | 4.2 | 3.5 | 2.5 | 1.7 | 2.1 | 1.8 | 3.4 | 2.1 | 2.3 | 1.9

Male	3.8	4.9	3.4	5.1	3.2	2.6	1.9	3.8	
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- i) Test the claim at 5% level of significance that female neonate weight is less than that of males (9 marks)
- ii) Determine the 95% confidence interval for the mean weight of the male neonates (3 marks)
- b) If 3% of drug manufactured by a firm are ineffective find the probability that in a sample of 200 drug
- i) At most 3 are ineffective (3 marks)
- ii) At least 4 are ineffective (2 marks)
- c) Highlight three advantages of sampling over census (3 marks)

#### QUESTION FOUR (20 MARKS)

- a) A researcher would like to test whether there is any difference in weight gains in infants after being given four feed supplements. The weight gains in grams were recorded as follows

A	87	52	81	85
B	65	74	65	88
C	79	80	65	81
D	78	91	65	79

- At 5% level of significance, test the null hypothesis that there is no significance difference in weight gains from the four feed supplements (14 marks)
- b) The hospital charge account at a certain department store is approximately normally distributed with an average balance of \$80 and a standard deviation of \$30. What is the probability that a charge account randomly selected has a balance:?
- (i) Over \$125 (2 marks)
- (ii) Between \$65 and \$95 (2 marks)
- c) State two conditions for the use of the ANOVA test (2 marks)

#### QUESTION FIVE (20 MARKS)

- a) A study was conducted concerning the blood pressure of 60-year-old women with glaucoma. In the study, 200 60-year-old women with glaucoma are randomly selected and the sample mean systolic blood pressure is 140 mm Hg and the sample standard deviation is 25 mm Hg.

- i. Calculate a 95% confidence interval for the true mean systolic blood pressure among the population of 60-year-old women with glaucoma. (5 marks)
  - ii. Suppose the study above was based on 100 women instead of 200 but the sample mean (140) and standard deviation (25) are the same. Recalculate the 95% confidence interval. Does the interval get wider or narrower? Why? (5 marks)
- b) A pharmaceutical firm reported that on average a certain drug has a lifespan of 4 years with a standard deviation of 0.4 years. In a certain season, 2.6% of drugs were destroyed for being on the shelf after the expiry time.
- i. If the hospital buys drugs from the firm, determine the probability that its lifespan will be,
    - Less than 2 years (2 marks)
    - Between 2 and 5 years. (3 marks)
    - More than 4 years (1 mark)
  - ii. Determine the expiry period for the firm drugs. (4 marks)