CANDIDATE NUMBER…….

"Investing in Africa's Future"

COLLEGE OF HEALTH, AGRICULTURE & NATURAL SCIENCES
DEPARTMENT OF HEALTH SCIENCES
BACHELOR OF MEDICAL LABORATORY SCIENCES HONOURS

NSNS401 EPIDEMIOLOGY BIOSTATISTICS AND HEALTH INFORMATICS
END OF SEMESTER EXAMINATIONS

NOVEMBER 2020

LECTURER: DR MAXWELL MHLANGA

DURATION: 24 HOURS

INSTRUCTIONS

Do NOT write your name on the answer sheet.

Answer (fully) any one question of your choice.

Begin your answer for each question on a new page.

Each full question carries 100 marks.

Your full answer should be between 10 and 15 pages

Font: Times New Roman, Font size 12, Line space: 2.0.

Credit is given for neat, well-written and lucid work.

QUESTION 1 [100 MARKS]

Answer all questions in the three sections

SECTION A: EPIDEMIOLOGY [35 MARKS]

1. The Provincial Medical Director for Manicaland province has requested you to facilitate an orientation session on the principles of epidemiology, the essence and application of epidemiology in the contemporary world to improve public health outcomes. The session is to be delivered to the Provincial Health team in an annual planning meeting. Develop your presentation for this session bringing out the key applications of epidemiology to public health with relevant examples [20]
2. In a follow up study to determine sero-positivity rate of adolescents at clinic X that commenced in January 2018, running for two years to January 2020. At the beginning of the study 10 HIV negative adolescents were recruited and followed up. By 31 December 2020, 3 adolescents had tested HIV positive.
   (i) What was the two-year risk of becoming a case in this study? [2]
   (ii) What were the odds of becoming a case in this study? [2]

   (b) Diagnostic tests are usually checked for either sensitivity or specificity to decide which is important. Two tests for diagnosis of Systemic Lupus Erythematosus were used in a study namely, Anti-Nuclear Factor (ANF) and Anti-DNA Antibody test and the tables below show the results:

		Systemic Lupus	
		YES	**NO**
ANF Test	Positive	99	180
	Negative	1	720
		100	900

		Systemic Lupus	
		YES	**NO**
Anti- DNA Antibody test	Positive	75	7
	Negative	25	893
		100	900

   (i) Calculate the Sensitivity of the ANF test [3]
   (ii) Calculate the Specificity of the ANF test [3]

(iii) Calculate the Sensitivity of the Anti-DNA Antibody test [3]
(iv) Calculate the Specificity of the Anti-DNA Antibody test [2]

SECTION B: Biostatistics [35 marks]

1. (a) A population of 10 Midwifery nurses has the following ages: 31; 40; 27; 35; 35; 28; 42; 43; 50; 52. You are the school administrator and want to draw some conclusions from this data.

(i) Draw a stem and leaf diagram to display the data [2]
(ii) What is the modal age of the class? [2]
(iii) What is the mean age of the class?[2]
(iv) Calculate the standard deviation [2]
(v) Calculate the median age for the class [2]

(b) You now group your data as follows: 20-29; 30-39; 40-49; 50-59.

(i) Generate a frequency distribution for the data [2]

(ii) Generate a relative frequency distribution for the data [2]

(iii) Generate a cumulative relative frequency distribution of the data [2]
(iv) Draw a histogram to present your data [2]

(c) (i) Calculate the 25^{th} percentile (Q1) [2]

(ii) Calculate the 75^{th} percentile (Q3) [2]

(iii) Calculate the range [2]

(iv) Calculate the Inter-quartile range (IQR) [2]

(v)Draw a box and whisker plot for your results [4]

2. At a maternal ward for hospital Y, A sample of 25 infants had their birth weights taken and the mean was 2500g, s=900g. Calculate the 95% Confidence interval for the population mean. [5]

SECTION C: HEALTH INFORMATICS [30 MARKS]

1. Health informatics is a relatively new and developing discipline in Nursing Care. You have been invited at a National symposium to market health informatics in Nursing in twentieth century. In your articulation describe the wide role health informatics as a critical component of system-wide efforts to improve public health practice, training, research and Nursing administration [20]

2. Giving practical examples, outline how you would justify the use of Electronic health Records in contemporary nursing, citing benefits and demerits of Electronic Health Records from your clinical experience. [10]

END OF QUESTION 1

QUESTION 2 [100 MARKS]

Answer all questions in the three sections

SECTION A: EPIDEMIOLOGY [35 MARKS]

1. You have been asked to conduct a research to answer the research question: Does Vitamin A supplementation prevent blindness in under-fives? Suggest and justify a research design for this study , showing clearly how your study design will answer the research question **[20]**
2. (a)A study sought to determine the effect of Intervention A by comparing this intervention with intervention B. Using your understanding of rates in epidemiology, interpret the following findings in an epidemiological study, clearly explaining what it means
   - **(i)** OR = 2.3 **[2]**
   - **(ii)** OR = 1 **[2]**
   - **(iii)** OR < 1 **[2]**
   - **(iv)** A relative risk = 1.7 **[2]**
   - **(v)** A relative risk of 0.6 **[2]**

(b) A prospective study recruited 10,000 smokers and 10,000 non-smokers aged 30 to 39 and followed them for 20 years. The cases of throat cancer are shown in this table.

	No. Cancer	Cancer	Relative Frequency(%)
Smokers	9800	200	2.0%
Non-Smokers	9950	50	0.5%

What is the estimated relative risk of throat cancer for smokers vs. non-smokers? **[3]**
What is the overall prevalence rate of cancer in this study? **[2]**

SECTION B: Biostatistics [35 marks]

3. The time from first exposure to HIV infection to AIDS diagnosis is called the incubation period. The incubation periods of a random sample of 14 HIV infected individuals is given below (in years): 12.0 ;10.5; 5.2; 9.5; 6.3; 13.1; 13.5; 12.5; 10.7 ; 7.2; 14.9; 6.5; 8.1; 7.9. The sample mean is 9.85 and the sample standard deviation is 3.06.
   - **(a)** Calculate the 95% confidence interval for the population mean. **[9]**
   - **(b)** What 2 assumptions are required for the confidence interval to be valid and how do you check each assumption? **[6]**
4. From your experience now in both theory and practice in Biostatistics, distinguish between observational and experimental studies **[5]**
5. We are interested in the distribution of blood pressure for people who are overweight (BMI >25). We assume the distribution is normal with mean μ and standard deviation σ. We take a sample of 25 people who are overweight, we measure their blood pressure, and find that the sample mean is 140 and the sample standard deviation is 10. Write down the point estimate for the population mean and the corresponding standard error, as well as

the margin of error, and confidence interval at 0.9 confidence level. We know that based on the t(24) distribution, 0.85-quantile = 1.06, 0.9-quantile = 1.32, and 0.95-quantile = 1.71 **[10]**

6. Using your theoretical and clinical experience and drawing examples from them, explain the essence of descriptive statistics in health research **[5]**

SECTION C: HEALTH INFORMATICS [30 MARKS]

3. Health informatics has impacted on Nursing care and health care in different ways. Building upon your practical experiences and knowledge on health informatics, discuss the impact of health informatics and advanced technologies in patient management and Nursing care in general **[20]**
4. As public health nurse, one is required to be able to make good plans for community mobilisation. Formulate a plan for a social media campaign to improve the health behaviour of pregnant women in a rural community. **[10]**

END OF QUESTION 2

QUESTION 3 [100 MARKS]

Answer all questions in the three sections

SECTION A: EPIDEMIOLOGY [35 MARKS]

1. You have conducted a randomised community trial of children in 450 villages on vitamin A supplementation and the table below is a summary sheet of your results.

Vitamin A	Alive at 12 months Yes	Alive at 12 months No	Total
No	11 514	74	11 588
Yes	12 048	46	12 094
Total	23 562	120	23 682

Use the table to answers the following questions:

(i) What proportion of your sample remained alive throughout the study? **[2]**
(ii) Of those who died, what proportion had received Vitamin A? **[2]**
(iii) What was the risk of death among those who received Vitamin A? **[2]**
(iv) What was the risk of death among those who did not receive Vitamin A? **[2]**
(v) Calculate the relative risk of death in this study? **[2]**
(vi) Calculate the Odds of survival for those who received Vitamin A**.[2]**
(vii) Calculate the Odds of survival for those who did not receive Vitamin A. **[2]**
(viii) Calculate the Odds Ratio for survival in this study. **[2]**
(ix) From your results, does vitamin A reduce mortality? Justify your answer. **[4]**

2. Basing on your theoretical knowledge and clinical experience, discuss the **5** critical questions the epidemiological approach seeks to answer in understanding epidemics? **[15]**

SECTION B: BIOSTATISTICS [30 MARKS]

7. Now that you have learnt about biostatistics and have also explored several studies that employ biostatistics concepts. Show using examples the distinction between descriptive and inferential statistics in applied research **[20]**.
8. A random sample of 12 subjects diagnosed with hypertension had the following ages recorded: 32.8 40.0 41.0 42.0 45.5 47.0 48.5 50.0 51.0 52.0 54.0 59.2. The population standard deviation in age at diagnosis of all hypertensives is known to be 7.2 years. Calculate the 95% CI for the true age at diagnosis. **[5]**
9. A random sample of patients with breast cancer at Clinic Y has the following attributes, n = 25, mean age = 50 and s = 8. Set up a 95% confidence interval estimate for the population mean of women with breast cancer at clinic Y. **[5]**

SECTION C: HEALTH INFORMATICS [35 MARKS]

1. Making reference to the contemporary world, describe how consumers use technology for health, including searching for information and using online tools to manage or improve their health **[20]**
2. One of the duties of a community nurse in health promotion is to assess the quality of messages and their impact to the intended beneficiaries. Discuss the key things you would consider in the evaluation of consumer health information **[15]**

END OF QUESTION 3