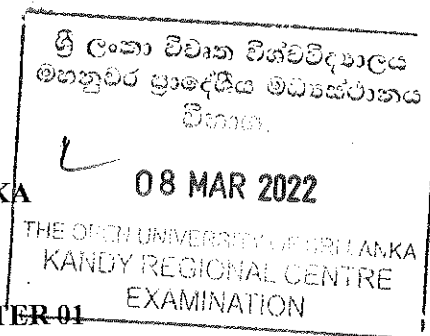**THE OPEN UNIVERSITY OF SRI LANKA**
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2020/2021 – SEMESTER 01
BACHELOR OF PHARMACY HONOURS
BACHELOR OF MEDICAL LABORATORY SCIENCES HONOURS

BSU4230 – BASIC STATISTICS – LEVEL 04
FINAL EXAMINATION
DURATION: TWO HOURS

DATE: 8th of March 2022   TIME: 1.30 pm- 3.30 pm

INDEX NO: ....

IMPORTANT INSTRUCTIONS / INFORMATION TO CANDIDATES

- This question paper consists of **05 pages** with **04 Essay Questions:**

  - Essay Questions (200 marks): There are 04 essay questions. Write answers in the answer books provided.

- Necessary Formulae/ Z table are given in the page 5.

- Answer **ALL** questions.

- Write your **Index Number** in the space provided.

- Do NOT bring in on person or have in possession unauthorized materials, including mobile phones and other electronic devices, or violate any other examination rules.

- **Non-programmable calculators are allowed to use.**

BSU4230-BASIC STATISTICS
FINAL EXAMINATION

Essay Questions
(Total marks:200)

1. In a hospital based research study, one hundred and fifty (150) male patients and fifty (50) female patients were investigated. Gender, blood pressure (mmHg), HDL level (mg/dL) and number of convulsions experienced during the hospital stay were recorded for each patient.

a)

i. Classify the study variables as either quantitative or qualitative. **(8 marks)**
ii. Classify the quantitative variables as either discrete or continuous. **(4 marks)**
iii. Suggest 2(two) central tendency measures and 2(two) dispersion measures that can be used to summarize continuous data. **(8 marks).**
iv. Suppose the mean HDL level of male patients was 60 mg/dL with a standard deviation of 4 mg/dL and the mean HDL mg/dL of female patients was 50 mg/dL with a standard deviation of 2 mg/dL. Calculate the coefficient of variations for both male and female patients. **(8 marks)**
v. Based on the values calculated in part iv), comment on the variability of HDL level in male and female patients. **(2 marks)**

b) The following table shows the total number of convulsions experienced by male and female patients during the period of September to December in the last year.

Gender	September	October	November	December
Male	60	70	50	70
Female	40	50	30	50

i. Sketch a compound bar chart for the data given above. **(10 marks)**
ii. Sketch a pie chart to show the distribution of total number of convulsions experienced by the patients by month for this study period. **(10 marks)**

2.

a) One hundred (100) persons were selected to check whether Rapid Antigen Test (RAT) is a good screening test for the identification of COVID-19 patients. Polymerase chain reaction (PCR) test is considered as the diagnostic test. All 100 persons were tested using the RAT and PCR tests. The participants were labeled as either having Covid -19 (Covid +) or free of Covid -19 (Covid -). Results are given below.

	PCR test		Total
	Covid +	Covid -	
RAT (Covid +)	30	20	50
RAT (Covid -)	30	40	70
Total	60	60	120

  i. Calculate sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of RAT. **(16 marks).**
 ii. Calculate the probability that a randomly selected person has a positive test result from RAT. **(4 marks)**
iii. Calculate the probability that a randomly selected person has a negative test result from RAT. **(4 marks)**
 iv. If 3 (three) people are randomly selected, find the probability that all of them will be identified as Covid-19 (Covid +) persons, according to PCR. **(8 marks)**

b) Suppose the Body Mass Index (BMI) of a group of adult females are normally distributed with mean 23 (Kg/h^2) and standard deviation 2 (Kg/h2).

  i. Find the probability that a randomly selected adult female from this group has a BMI greater than 24 (Kg/h^2) using the Z table. **(8 marks)**

 ii. Any adult female whose BMI is greater than "y" (Kg/h^2) is classified as overweight or obese. If 40% of adult females are found to be overweight or obese, find the value of "y" using the Z table. **(10 marks)**

3.

a) To assess a possible association between working with COVID-19 patients and the development of depressive symptoms in nurses, an investigator conducted a study with a randomly selected 100 nurses who worked with COVID-19 patients and another 100 nurses who did not work with COVID-19 patients. In the group of nurses who worked with COVID-19 patients there were 42 nurses with depressive symptoms and in the other group of nurses were 20 nurses with depressive symptoms.

i. What is the type of study described here? **(4 marks)**

ii. List two (2) advantages and two (2) disadvantages of the study design that you have suggested in the previous question? **(8 marks)**

iii. Construct a 2 x 2 table using the data. **(8 marks)**

iv. Determine whether working with COVID-19 patients is associated with development of depressive symptoms in this target group. **(10 marks)**

b)

i. List two (2) probability and 2 non probability sampling methods. **(4 marks)**

ii. What is sampling error? **(2 marks)**

iii. What is sampling frame? **(2 marks)**

iv. Define the following terms

    (a) Crude.death rate **(3 marks)**

    (b) Crude birth rate **(3 marks)**

    (c) Age-specific death rate **(3 marks)**

    (d) Incidence rate **(3 marks)**

4.

a) The LDL level (mg/dL) of a randomly selected group of 10 patients are given below.

170	200	210	180	190	150	240	240	140	160

i. Calculate the Mean of the above data set. **(4 marks)**

ii. Determine the median and mode of the above data set **(4 marks)**

iii. Calculate the inter quartile range of the above data set **(4 marks)**

iv. Sketch a box and whisker plot for the given data and denote the first quartile (Q1), second quartile (Q2) and third quartile (Q3) in the plot. **(10 marks)**

v. The distribution of the LDL level is symmetric. Do you agree with this statement? Give reasons for your answer based on the box plot in part iv. **(8 marks)**

b) In a random sample of 60 school children, there were 25 obese, 18 over weight, 7 normal and 10 malnourished children.

i. Construct a frequency table for 4 categories of BMI and calculate the relative frequencies as percentages and cumulative frequency percentages %. **(12 marks)**

ii. Find the standard error of the proportion of overweight children in this sample. **(8 marks)**
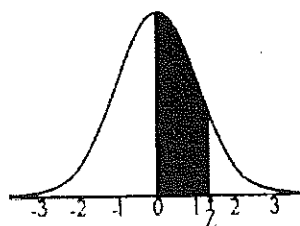
STANDARD NORMAL TABLE (Z)

Entries in the table give the area under the curve between the mean and z standard deviations above the mean. For example, for z = 1.25 the area under the curve between the mean (0) and z is 0.3944.

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4056	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998