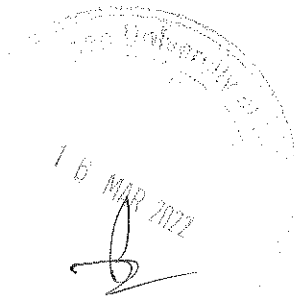**THE OPEN UNIVERSITY OF SRI LANKA**
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2020/2021 – SEMESTER 01
BACHELOR OF SCIENCE HONOURS IN NURSING
BSU5335 – HEALTH STATISTICS – LEVEL 05
FINAL EXAMINATION
DURATION: 3 HOURS

DATE: 16th March 2022   TIME: 1.30 PM – 4.30 PM

INDEX NO:..

IMPORTANT INSTRUCTIONS / INFORMATION TO CANDIDATES

- This question paper consists of **11 pages** with **3 Parts**:

- **PART A: Multiple Choice Questions - MCQs (40 marks):** There are 20 MCQs. Indicate answers for **all questions** in the answer sheet provided by placing a cross (x) in ink in the relevant cage (answers in pencil will not be marked).

- **Part B: Structured Essay Question - SEQ (15 marks):** This section contains one (01) question and this is **compulsory**. Write the answer within the space provided in the question paper.

- **Part C: Structured Essay Questions - SEQs (45 marks):** There are 5 structured essay questions. Write answers for **only three** questions in the answer books provided.

- **All the MCQ questions and the First SEQ are compulsory. Altogether, 4 SEQs need to be answered.**

- 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.

- Do NOT remove any page/part of this question paper from the examination hall.

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

**BACHELOR OF SCIENCE HONOURS IN
NURSING BSU5335 – HEALTH STATISTICS
LEVEL 5 - FINAL EXAMINATION**

INDEX NO: ………………………………

ANSWER SHEET FOR PART A

Q. No.	(a)	(b)	(c)	(d)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
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10.				
11.				
12.				
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14.				
15.				
16.				
17.				
18.				
19				
20.				

Part A – Multiple Choice Questions

(2 * 20 = 40 Marks)

There are 20 MCQs. Indicate answers for **all questions** in the answer sheet provided

Choose the most suitable/best answer and indicate with a 'X' in the answer sheet.

1. Discrete variable data includes
   a. Blood pressure
   b. Type of disease
   c. Size of the household
   d. Gender

2. Quartiles divides the data set into
   a. Two parts
   b. Three parts
   c. Four parts
   d. Ten parts

3. The graphical representation of a cumulative relative frequency distribution is called
   a. Component bar chart
   b. Pie diagram
   c. Ogive
   d. Scatter diagram

4. Measures of central tendency includes
   a. Mean
   b. Range
   c. Variance
   d. Standard deviation

5. Variables that can be measured using ratio scale includes
   a. Severity of a disease
   b. Gender
   c. MOH area
   d. Blood Glucose level

6. In the standard normal distribution
   a. Median = 1
   b. Variance = 0
   c. Standard deviation = 2
   d. Mean = 0

7. Non-probability sampling method includes
   a. Purposive sampling
   b. Simple Random sampling
   c. Systematic sampling
   d. Cluster sampling

8. The standard error of the mean (SEM)
   a. is the square root of the variance
   b. measures the spread of observations around the mean
   c. assesses the reliability of the data
   d. is always greater than the standard deviation

9. The process of selecting a subset of a population for a study is known as
   a. survey research
   b. sampling
   c. data collection
   d. data analyzing

10. Statistical tests that can be used to identify whether there is a relationship between two categorical variables include
    a. Student's t-test
    b. Spearman's correlation test
    c. Chi-square test
    d. Mann-Whitney test

11. Crude death rate is calculated using the formula
    a. Number of infant deaths/ total number of deaths in a population
    b. Number of people in a population who died/ total population x 1000
    c. Number of people in a population who are expected to die in a given year/ people who actually died
    d. Number of people in a specific age group who died/ total population

12. In a screening test, specificity is the ability of a test to correctly identify
    a. False positives
    b. True positives
    c. True negatives
    d. False negatives

13. In the t-test, the dependent variable must have
    a. Nominal or interval data
    b. Ordinal or ratio data
    c. Interval or ratio data
    d. Ordinal or interval data

14. The degrees of freedom for the Chi-Square test for 4 x 4 contingency table is
    a. 4
    b. 5
    c. 9
    d. 12

15. The regression equation predicts the height of daughters aged between 12- 20 years (in inches) based on their father's height is as follows; Ý=3.46+0.41X. What would be the height of daughter when father's height is 70.5 inches?

   a. 30.25 inches
   b. 32.37 inches
   c. 31.42 inches
   d. 33.36 inches

16. Serum potassium levels of a group of patients were measured. The data set was normally distributed and no outliers. The variability of this data set can BEST be measured by

   a. Inter quartile range
   b. Range
   d. Coefficient of variation
   e. Standard deviation

17. Non-parametric tests include

   a. T- test
   b. Sign test
   c. Z test
   d. F test

18. A test is conducted for H_0: $\mu = 34$, with $\sigma = 5$. A sample of size 100 is selected. The standard error of the sampling distribution is

   a. 0.5
   b. 1
   c. 1.5
   d. 2

19. Survival analytical techniques can be used in

   a. Cross sectional studies
   b. Case control studies
   c. Cohort studies
   d. Case studies

20. In analysis of variance (ANOVA) test

   a. F distribution is used
   b. t distribution is used
   c. z distribution is used
   d. Chi-squared distribution is used

Part B –Structured Essay Question
(15 * 1 = 15 Marks)

Writing answer for this question is **compulsory**. Write the answer within the space provided in the question paper.

01.
  a)
    i. List 2 uses of health statistics in nursing practice.

(2 Marks)

    ii. List 4 characteristics of the Standard Normal distribution.

(2 Marks)

    iii. List 2 graphical methods used in descriptive statistics.

(2 Marks)

    iv. List 3 characteristics of a test that can be used as a screening test.

(2 Marks)

b)

i. In a sample of 100 patients there were 20 patients with cardiovascular diseases. Calculate the standard error of the proportion of cardiovascular patients in this sample.

(3 marks)

ii. A total of 400 patients had undergone a screening test. There were 180 True Positives, 8 False Positives, 190 True Negatives and 22 False Negatives. What is the sensitivity and specificity of this test?

(4 marks)

Part C –Structured Essay Questions
(15 * 3 = 45 Marks)

There are 5 structured essay questions. Write answers for **only three** questions in the answer books provided.

01. Level of anxiety of a group of 7 psychiatric patients were measured using the Generalized Anxiety Disorder Questionnaire (GAD – 7). The scores are given below.

Patient number	GAD-7 score (x_i)	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
1	8		
2	12		
3	14		
4	9		
5	8		
6	10		
7	15		

    a. Complete the above table.   **(3 marks)**
    b. Calculate mean, median and mode of the above data set.   **(3 marks)**
    c. Calculate the variance and the standard deviation of the above data set
        (4 marks)
    d. Compute standard error of the mean of the above data set   **(2 marks)**
    e. Compute 95% confidence interval (95% CI) of the population mean of GAD-7 in this target population.   **(3 marks)**

2. A group of patients (n= 100) who attended the outpatient clinic in a hospital was tested for blood glucose. The mean fasting blood glucose level of the sample was 7 mmol/L and the standard deviation was 2 mmol/L.

    a. If the fasting blood glucose level between 3.9 to 5.5 mmol/L is considered as normal, what percentage of the patients were having normal blood glucose level?   **(4 marks)**
    b. If the fasting blood glucose level between 5.6 to 6.9 mmol/L is considered as having pre-diabetes, what percentage of the patients were pre-diabetics?
        (4 marks)
    c. What is the standard error of the mean blood glucose level of this sample?
        (3 marks)
    d. Compute the 95% confidence interval (95% CI) for the population mean of blood glucose in this target group.
        (4 marks)

3. Data on back pain of a group of 200 randomly selected nurses was obtained. Results are given below.

	Male Nurses	Female nurses
Having back pain	40	70
Not having back pain	60	30

    a. If we randomly select a participant from this sample what is the probability of getting selected a male nurse with back pain? **(2 marks)**

    b. Just by looking at prevalence which group has the higher risk of developing back pain? **(2 marks)**

    c. If a researcher is interested in identifying whether there is a gender difference of back pain in nurses, what should be the null and the alternative hypothesis? **(4 marks)**

    d. Using the data test your hypotheses at 5 % significant level. **(7 marks)**

4.

  i. A nursing practitioner is interested in identifying risk factors of asthma in children. She is planning to conduct a case-control study.

    a. What is the difference between cohort and case-control studies? **(2 marks)**

    b. A case- control study was conducted to identify risk of passive-smoking in developing asthma in children, The Odds ratio (OR) was 3. How do you interpret this result? **(2 marks)**

  ii.

    a. List 2 qualitative data collection methods **(2 marks)**

    b. List 2 quantitative data collection methods **(2 marks)**

    c. What are the sections that should be included in a research protocol (research proposal)? **(7 marks)**

5.

  i. A researcher is interested in investigating association between age (in years) and level of blood cholesterol (mmol/L). Regression equation of level of cholesterol and age is determined by the equation:

$$\text{Cholesterol} = 1.2 + 0.06 \text{ (Age)}$$

    a. Is the relationship between level of cholesterol and age positive or negative? **(2 marks)**

    b. What is the level of cholesterol of a person aged 50 years? **(5 marks)**

  ii. Define the following terms

    a. Attack Rate **(2 marks)**

    b. Maternal mortality rate **(2 marks)**

    c. Infant mortality rate **(2 marks)**

   d. Crude death rate **(2 marks)**

Necessary Formulae

The following equations are given in the usual/ standard notation.

$$SE\ (\bar{x}) = \frac{SD}{\sqrt{n}} \qquad SE\ (p) = \sqrt{\frac{pq}{n}}$$

Necessary Statistical Tables

Chi-Square Table

Degrees of freedom	α									
	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01	0.005
1	—	—	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.071	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.299
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.042	30.813	33.924	36.781	40.289	42.796
23	9.262	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.194	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.257	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.954	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169
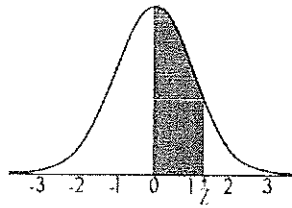
STANDARD NORMAL TABLE (Z)

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.

z	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	0.4066	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