(15)

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2019/2020 – SEMESTER I

BACHELOR OF SCIENCE HONOURS IN NURSING
BSU5335 – HEALTH STATISTICS - LEVEL 5
CONTINUOUS ASSESSMENT II (NBT II) DURATION: $1\frac{1}{2}$ HOUR

DATE: 6th MARCH 2020 TIME: 09.00 AM – 10.30 AM

REGISTRATION NO: .....

IMPORTANT INSTRUCTIONS/ INFORMATIONS TO CANDIDATES

- This question paper consists of **12 pages** with **10 Multiple Choice Questions (Part A)** and **02 Structured Essay Questions (Part B).**
- Write your Registration Number in the space provided.
- Answer **ALL** questions
- **Multiple Choice Questions (Part A):** Indicate answers in the answer sheet provided by placing a cross (X) in **INK** in the relevant cage. (answers in pencil will **NOT** be marked)
- **Structured Essay Questions (Part B):** Write answers within the space provided.
- Do not remove any page/part of this question paper from the examination hall.
- Necessary table is given in page 11.
- Mobile phones and any other electronic equipment are **NOT** allowed. Leave them outside.
- **Non-programmable calculators are allowed.**
- **Please fill the address sheet. (See last page).**

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CONTINUOUS ASSESSMENT II (NBT II)

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ANSWER SHEET FOR PART A

Q. No.	(a)	(b)	(c)	(d)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

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Part A – Multiple Choice Questions

(20 marks)

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

1. Which one of the following best describes Type I error?
   a) The null is true, but we mistakenly reject it
   b) The null is false, and we reject it
   c) The null is true, and we do not reject it
   d) The null is false, but we fail to reject it

2. The average resting pulse rate ($\bar{x}$) of randomly selected 9 women's is 76 beats per minute, and the sample standard deviation (s) is 5. The standard error of the sample mean is
   a) 0.56
   b) 1.80
   c) 1.67
   d) 8.44

3. In a random sample of 1000 patients, the sample proportion ($\hat{p}$) equivalent to 0.80 ($\hat{p} = 0.80$) have faced a medical test. The standard error of $\hat{p}$ is
   a) 0.013
   b) 0.160
   c) 0.640
   d) 0.800

4. A researcher obtains 18 blood samples from a hospital and measures blood glucose level. Assume data are followed standard normal distribution. He squares each sample glucose level and sums all the squares. The number of degrees of freedom for a Chi Square distribution will be
   a) 17
   b) 18
   c) 19
   d) 20

5. What is the mean of a Chi square distribution with 6 degrees of freedom?
   a) 4
   b) 6
   c) 8
   d) 12

6. The purpose of simple linear regression analysis is to:
   a) replace data points on a scatter diagram by a straight-line
   b) measure the degree to which two variables are linearly associated
   c) obtain the expected value of the independent random variable for a given value of the dependent variable
   d) predict one variable from another variable

7. The strength of the linear relationship between two numerical variables can be measured by
   a) a scatter diagram
   b) determining the slope
   c) determining the Y intercept
   d) the correlation coefficient

8. The value of the (r) correlation coefficient (association between two variables) lies between;
   a) 0 and 1
   b) -1 and 0
   c) -1 and 1
   d) -0.5 and 0.5

9. In an experiment, subjects are randomly divided into three groups as control, experimental A, or experimental B and, a specific treatment is applied into these three groups. After applying treatment, the mean scores for the three groups are compared. The appropriate statistical test for comparing these means is
   a) The analysis of Variance
   b) The Correlation of Coefficient
   c) Chi Square
   d) The t-test

10. Which of the following distributions is followed by ANOVA?
   a) Chi-square
   b) t
   c) F
   d) Z

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Part B –Structured Essay Questions
(80 marks)

Write answers in the space provided.

01. The amount of a certain trace element in blood is known to vary for male blood donors and female blood donors. A medical student wanted to test the likelihood that the population means of concentrations of the element are same or not for men and women. The observed summary statistics were recorded in the following table.

	Sample 1 – (Male donors)	**Sample 2 – (Female donors)**
Sample size (n)	75	50
Mean ($\bar{x}$)	28 ppm	33 ppm
Standard deviation (s)	14.1 ppm	9.5 ppm

i) Are these samples, large or small? Comment on the above sample size (n).

(2 Marks)

ii) Calculate the 95% confidence intervals separately for both **sample 1** and **sample 2.**

(10 Marks)

iii) Clearly write the hypothesis to check the above test.

(5 Marks)

iv) What is the statistical test that can used to test the above hypothesis?

(2 Marks)

v) Calculate the test statistic value.

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

(Standard notations have been used)

(10 Marks)

vi) Write down the critical value to test the above hypothesis at 5% significance level.

(2 Marks)

vii) Test the hypothesis at 5% significance level.

(6 Marks)

viii) Write the conclusion.

(3 Marks)

2. The data from ten children ($n = 10$) between 6 to 10 years old were used to check the variation of forced exhalation volume (FEV) (Y variable), a measure of how much air somebody can forcibly exhale from their lungs, with the age (X variable). Summary of data are given below.

	FEV (Y)	Age (X)
	1.7080	9
	1.7240	8
	1.6020	6
	1.7200	7
	2.1180	8
	1.9870	8
	1.8780	6
	1.8050	9
	2.9880	9
	1.6340	6
Sum	(a)	(b)
Mean	(c)	(d)

$$\sum(X_i - \overline{X})(Y_i - \overline{Y}) = 2.23$$

$$\sum(X_i - \overline{X})^2 = 16.4 \quad \textit{and} \quad \sum(Y_i - \overline{Y})^2 = 1.49$$

$$r = \frac{\Sigma(x - \bar{x})(y - \bar{y})}{\sqrt{[\Sigma(x - \bar{x})^2 \Sigma(y - \bar{y})^2]}}$$ (Standard notations have been used)

i) Write down the sum and mean of Y and X variables. (Fill the blanks given in above table)

(8 Marks)

ii) Calculate the correlation coefficient to find the relationship between Y and X. (Necessary information given above)

(4 Marks)

iii) Comment on the value of calculated correlation coefficient in part (ii).

(2 Marks)

iv) Sketch the scatter plot to show the above relationship roughly.

(5 Marks)

v) Fit a least squares linear regression line for this data to predict the forced exhalation volume based on the age value. ($Y=a+bX$)

$$b = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\Sigma(x-\bar{x})^2}$$

(Standard notations have been used)

$$a = \bar{y} - b\,\bar{x}$$

a) Calculate the slope parameter.

(5 Marks)

b) Calculate the intercept parameter.

(5 Marks)

c) Write down the fitted regression line.

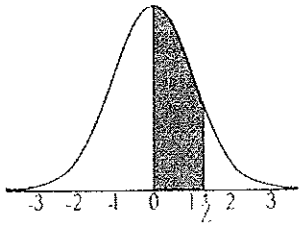
(2 Marks)

d) Comment on the slope parameter and the intercept parameter values, you have obtained.

(4 Marks)

e) Estimate the value of forced exhalation volume (FEV) for children whose age values are 6 and 10.

(5 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.

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

Reg. No:.....

Name:.....

Address:.....

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