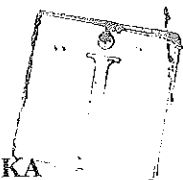


00700



THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2022/2023 – SEMESTER 01
BACHELOR OF SCIENCE HONOURS IN NURSING
BSU5335 – HEALTH STATISTICS – LEVEL 05
FINAL EXAMINATION
DURATION: 3 HOURS

DATE: 31st March 2023

TIME: 9.30 AM – 12.30 PM



NDEX NO:

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

This question is a **compulsory question**. Write the answer within the space provided in the question paper.

01.

a)

i. List the main 2 types of quantitative variables.

(2 Marks)

ii. List 2 advantages of sampling.

(2 Marks)

iii. List 2 types of Probability sampling methods.

(2 Marks)

iv. List 2 methods that we use to measure reliability of a test.

(2 Marks)

b) A sample of size $n = 64$ is drawn from a normal population whose standard deviation is $\sigma = 3.2$. The sample mean (\bar{x}) is 32.

i. Calculate the standard error of a mean.

(3 Marks)

ii. Construct a 95% confidence interval of the population mean.

(4 marks)

INDEX NO:

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. Find the answers to the following questions using the following data set.

5, 6, 2, 4, 7, 8, 3, 5

- a. Calculate the mean, median and mode of the data set. **(5 marks)**
 b. Find the range of the data set. **(2 marks)**
 c. Complete the following table. **(4 marks)**
 (Copy this table into your answer sheet.)

x_i	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
5		
6		
2		
4		
7		
8		
3		
5		

- d. Calculate the variance of the data set. **(2 marks)**
 e. Compute the coefficient of variation. **(2 marks)**

02.

- a. Define the following terms. **(6 marks)**
 i. Simple event.
 ii. Independent events.
 iii. Conditional probability.
- b. It is given that $P(A) = 0.7$, $P(B) = 0.5$ and $P(A \cap B) = 0.4$
 i. Justify whether events A and B are independent or not. **(3 marks)**
 ii. Find $P(A \cup B)$ **(3 marks)**
 iii. Find $P(A/B)$ **(3 marks)**

- 03.
- Define the term the Probability Mass Function (PMF)? (3 marks)
 - List two discrete probability distributions. (2 marks)
 - List two characteristics of normal distribution curve. (2 marks)
 - In a private hospital, patients arrive at a mean rate of 2 per hour. Find the probabilities for the following situations using the Poisson distribution formula.

$$P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!} \quad \text{Where } x = 0, 1, 2, \dots \text{ and } e = 2.718$$

(8 marks)

- Zero number of patients arrived in an hour.
- Arrival of 5 patients in an hour.

04. A doctor wants to determine whether there is a gender difference of having Corona virus. A random sample of 100 person's PCR test records was obtained, and the data are as follows.

Gender	PCR Test Result		Total
	Positive	Negative	
Male	10	50	60
Female	15	25	40
Total	25	75	100

Chi-squared test is used to check the doctor's claim.

Gender	Cancer disease	Observed frequency (f_o)	Expected frequency (f_e)	$\frac{(f_o - f_e)^2}{f_e}$
Male	Positive	10	A	E
Male	Negative	50	B	F
Female	Positive	15	C	G
Female	Negative	25	D	H
	Total	100	-	I

- State the null and alternative hypothesis (2 Marks)
 - Determine the values for the letters A-I given in the above table. (9 Marks)
 - What is the degree of freedom of the chi-squared test? (1 Marks)
 - Clearly state your conclusion about the test at a 5% significance level. (3 Marks)
- (Hint: Consider Chi-square table value for 5% level at 1 df is 3.84)

05. The study evaluated a new medication's efficacy in **reducing autistic children's repetitive behaviors**. Eight autistic children joined the study, and the duration of each child's repetitive behavior during the three-hour observation period is counted both before and after the new medication is taken for a week. **Suppose that data are not following the normal distribution.** The data are as follows.

Child	Before treatment	After 1 week of treatment
1	85	75
2	70	50
3	40	50
4	65	40
5	80	20
6	75	65
7	55	40
8	20	25

- Propose the appropriate non-parametric test to assess the effectiveness of a new drug. **(2 marks)**
- Define the null and alternative hypothesis. **(2 marks)**
- Find the difference between values before treatment and after treatment. **(4 marks)**
- Perform the test to assess the effectiveness of a new drug and conclude at a 5% significance level. **(7 marks)**

Necessary Formulae

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

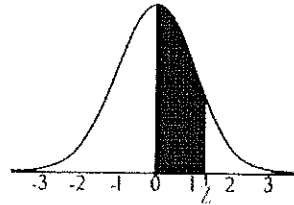
$$SE(\bar{x}) = \frac{SD}{\sqrt{n}} \quad SE(p) = \sqrt{\frac{pq}{n}}$$

$$\bar{x} \pm t \frac{s}{\sqrt{n}} \quad \bar{x} \pm z \frac{s}{\sqrt{n}}$$

Necessary Statistical Tables

Wilcoxon Sign Rank Table

Two-Sided Test α	0.1	0.05	0.02	0.01
One-Sided Test α	0.05	0.025	,01	0.005
<i>n</i>				
5	1			
6	2	1		
7	4	2	0	
8	6	4	2	0
9	8	6	3	2
10	11	8	5	3
11	14	11	7	5
12	17	14	19	7
13	21	117	13	10
14	26	21	16	13
15	30	25	20	16
16	36	30	24	19
17	41	35	28	23
18	47	40	33	28
19	54	46	38	32
20	60	52	43	37
21	68	59	49	43
22	75	66	56	49
23	83	73	62	55
24	92	81	69	61
25	101	90	77	68
26	110	98	85	76
27	120	107	93	84
28	130	112	102	92
29	141	127	111	100
30	152	137	120	109



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	0.4066	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