THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2023/2024 – SEMESTER 01
BACHELOR OF SCIENCE HONOURS IN NURSING
BSU5335 – HEALTH STATISTICS – LEVEL 05
FINAL EXAMINATION
DURATION: 3 HOURS

DATE: 22nd March 2024 TIME: 9.30 am – 12.30 pm

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Part B – Structured Essay Questions

(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 2 Discrete probability distributions. **(2 Marks)**

ii. List 2 examples of ordered categorical variables. **(2 Marks)**

iii. List 3 Non-Probability Sampling Techniques. **(3 Marks)**

b) X is a normally distributed variable with mean $\mu = 20$ and standard deviation $\sigma = 5$. Find the following probabilities.

i. $P(x < 30)$ **(4 Marks)**

ii. $P(x > 15)$ **(4 Marks)**

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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.

7,3,6,9,12,3,10,7,3,10

a) Calculate the mean, median and mode of the data set. **(5 Marks)**

b) Complete the following table. (Copy this table into your answer sheet.) **(5 Marks)**

xi	$(xi - \bar{x})$	$(xi - \bar{x})^2$
7		
3		
6		
9		
12		
3		
10		
7		
3		
10		

c) Calculate the variance of the data set. **(3 Marks)**

d) Compute the coefficient of variation. **(2 Marks)**

02. a) Define the following terms. **(6 Marks)**

i. Validity
ii. Reliability
iii. Diagnostic Test

b) Suppose a new screening test was done on 700 people. The screening test was positive in 70 of the people with the disease and 50 of the people without the disease. 100 of them were positive in the diagnostic test.

i. Calculate sensitivity, specificity, positive predictive value, and negative predictive value of the screening test. **(4 Marks)**
ii. What conclusions can be drawn from the results? **(2 Marks)**
iii. What is the prevalence of the disease? **(3 Marks)**

03. A public health study aims to explore the relationship between smoking habits and the fertility of women undergoing IVF (In Vitro Fertilization) treatments. Data was collected from 586 women and categorized into smokers and non-smokers, and to the number of IVF cycles (1 cycle, 2 cycles, 3+ cycles) they underwent. Data are given below.

	1 cycle	2 cycles	3+ cycle
smoking	29	16	55
Non-smoking	198	107	181

a) Calculate the expected frequencies for each category. **(4 Marks)**
b) State the null hypothesis (H0) and the alternative hypothesis (H1) for this analysis. **(2 Marks)**
c) Perform the Chi-square test of independence **(6 Marks)**
d) Interpret the results of your analysis in the context of the impact of smoking on the number of IVF cycles needed for a successful pregnancy. **(3 Marks)**

04. You are provided with data from a dichotic listening task aimed at investigating whether adults report verbally presented material more accurately from their right ear than from their left ear. **The data, which are positively skewed**, represent the scores obtained from the left and right ears of **12 participants**. Based on this information, answer the following questions.

Participant	Left ear	Right ear
1	30	32
2	29	30
3	10	8
4	31	32
5	27	20
6	24	32
7	29	30
8	26	27
9	25	32
10	5	32
11	20	30
12	32	32

a) State the most appropriate statistical test for assessing the differences in accuracy of auditory processing between the left and right ears. **(2 Marks)**
b) Define the null hypothesis and the alternative hypothesis for this study. **(2 Marks)**
c) Conduct the chosen statistical test, and what conclusions can be drawn from the results? **(11 Marks)**

05. **a)** Define the following terms. **(6 Marks)**

i. Sample Space

ii. Mutually Exclusive Events

iii. Bernoulli Distribution

b) It is given that $P(A) = 0.6$, $P(B) = 0.4$ *and* $P(A \cap B) = 0.3$.

i. Find $P(A \cup B)$. **(3 marks)**

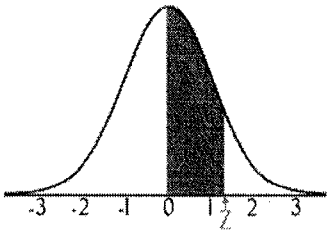
ii. Find P(B/A). **(3 Marks)**

iii. Assume that A and B are independent events and find P(A/B). **(3 Marks)**

----------END OF QUESTION PAPER----------

NECESSARY STATISTICAL TABLES

Z TABLE



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

WILCOXON SIGNED- RANKS TABLE

Two-Sided Test α	0.1	0.05	0.02	0.01
One-Sided Test α	0.05	0.025	,01	0.005
n				
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

CHI-SQUARE TABLE

Chi-square Distribution Table

d.f.	.995	.99	.975	.95	.9	.1	.05	.025	.01
1	0.00	0.00	0.00	0.00	0.02	2.71	3.84	5.02	6.63
2	0.01	0.02	0.05	0.10	0.21	4.61	5.99	7.38	9.21
3	0.07	0.11	0.22	0.35	0.58	6.25	7.81	9.35	11.34
4	0.21	0.30	0.48	0.71	1.06	7.78	9.49	11.14	13.28
5	0.41	0.55	0.83	1.15	1.61	9.24	11.07	12.83	15.09
6	0.68	0.87	1.24	1.64	2.20	10.64	12.59	14.45	16.81
7	0.99	1.24	1.69	2.17	2.83	12.02	14.07	16.01	18.48
8	1.34	1.65	2.18	2.73	3.49	13.36	15.51	17.53	20.09
9	1.73	2.09	2.70	3.33	4.17	14.68	16.92	19.02	21.67
10	2.16	2.56	3.25	3.94	4.87	15.99	18.31	20.48	23.21