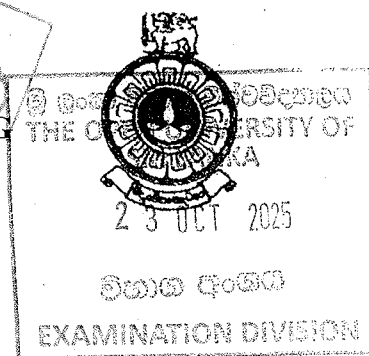


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THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF PSYCHOLOGY & COUNSELLING
2024/2025 – SEMESTER II — FINAL EXAMINATION



BSC (HONS) IN PSYCHOLOGY
PLU4303 – INTRODUCTION TO STATISTICS - LEVEL IV
FINAL EXAMINATION PAPER
DURATION: 03 HOURS

DATE: 23/10/2025

TIME: 9.30 AM – 12.30 PM

INDEX NO:.....

SECTION 2: STRUCTURED ESSAY QUESTIONS (60 MARKS)

Choose 04 out of the 06 questions given below and answer using the provided answer sheets.

- 2.1 A psychologist wants to examine whether different types of study strategies have an effect on exam performance among undergraduate students. Students were randomly assigned to one of three study strategies: Group A (Flashcards), Group B (Mind Mapping), Group C (Practice Tests). After two weeks, all students took the same exam, and their scores were recorded. The data are as follows:

Group A	Group B	Group C
78	82	88
85	85	91
80	87	86
83	84	90
79	86	89

- List the assumptions of Analysis of Variance (ANOVA). (04 Marks)
- State the null and alternative hypotheses for this study. (04 Marks)
- Calculate the mean for each group and the overall mean. (04 Marks)
- Compute the between-group sum of squares (SSB) and within-group sum of squares (SSW) and create the ANOVA table. (06 Marks)
- Compare the F-statistic value to the critical F-value at 5% significance level. State your decision. (07 Marks)

- 2.2 A researcher conducted a study to investigate factors influencing academic motivation among 120 college students. The following variables were collected:

- Academic motivation level (measured on a Likert scale from 1 to 7)
- Age of student
- Gender
- Major field of study (e.g., Psychology, Business, Engineering, Arts)
- Hours spent studying per week
- Number of assignments completed in the current semester
- Number of clubs or organizations joined

- i Identify the scale of measurement (nominal, ordinal, interval, or ratio) for each of the study variables. **(04 Marks)**
- ii Differentiate between Discrete and Continuous variables, with examples. **(04 Marks)**
- iii The following data represent the weights (kg) of 12 newborn babies:
 2.8, 3.1, 3.5, 2.9, 3.7, 3.3, 3.0, 2.6, 3.2, 3.4, 2.7, 3.6
 a) Compute the mean, median, and mode. **(06 Marks)**
 b) Find the first quartile (Q1), third quartile (Q3), and interquartile range (IQR). **(06 Marks)**
 c) Comment briefly on the spread of the data. **(05 Marks)**

- 2.3 A researcher investigates whether a mindfulness meditation program reduces anxiety levels in university students. The same group of 10 students was measured on a standardized anxiety scale before and after participating in a 6-week program. The scores are shown below:

Student	Before	After
1	60	55
2	62	58
3	65	59
4	70	66
5	68	63
6	72	68
7	75	70
8	74	71
9	69	65
10	71	67

- i Explain the purpose of a paired samples t-test and how it differs from an independent samples t-test. **(06 Marks)**
- ii State the null and alternative hypotheses. **(04 Marks)**
- iii Compute the t-statistics for the paired samples test. **(10 Marks)**
- iv Compare the test statistics with critical value at 5% significance level and interpret the results using the decision rule. **(05 Marks)**

- 2.4 A clinical psychologist wants to know whether type of intervention is associated with treatment outcome for clients with mild-to-moderate anxiety. A random sample of 120 clients after an 8-week program was classified as follows:

Intervention Type	Treatment Outcome	
	Improved	Not Improved
Cognitive Behavioural Therapy	30	10
Mindfulness	20	20
No intervention	30	10

- i State the null and alternative hypotheses for this study. (04 marks)
- ii Determine the values for the letters A-H given in the above table. (12 marks)

Observed Value (f_o)	Expected Value (f_e)	$\frac{(f_o - f_e)^2}{f_e}$
30	A	G
20	B	H
30	C	I
10	D	J
20	E	K
10	F	L

- iii Calculate the chi-squared test statistic. (04 marks)
- iv Obtain the chi-square critical value and compare it with the calculated value at the 5% significance level. Based on this, draw your conclusion. (05 marks)
- 2.5 A researcher wants to study the effect of daily study hours on exam performance among undergraduate psychology students. Data were collected from 8 participants, recording the number of hours they studied per day for two weeks (X) and their exam scores out of 100 (Y).

Participant	Study Hours per Day (X)	Exam Score (Y)
1	1	40
2	2	45
3	3	50
4	4	55
5	5	60
6	6	65
7	7	70
8	8	75

- i Explain what is meant by Regression Analysis. **(06 marks)**
- ii Briefly describe how the goodness of fit of a regression model can be assessed. **(04 marks)**
- iii Estimate the Regression Equation for the data provided. **(10 marks)**
- iv Using the estimated regression equation, predict the exam score of a student who studies 6.5 hours per day. **(05 marks)**

2.6 A health psychologist is interested in examining whether time spent on physical exercise per week is related to self-reported happiness scores among university students. Data were collected from 6 participants as shown below:

Participant	Hours of Exercise per Week (X)	Happiness Score (Y)
1	2	12
2	4	18
3	3	15
4	5	20
5	6	22
6	7	25

- i Plot a scatter diagram of the data and comment on the type and strength of the relationship. **(05 marks)**
- ii Explain the concept of Spurious Correlation. **(06 marks)**
- iii Compute the Pearson Correlation Coefficient (r) for the data. **(10 marks)**
- iv Interpret the findings in the context of psychology, commenting on the strength and direction of the relationship. **(04 marks)**

EQUATIONS AND TABLES

$$F = \frac{SSB/(k-1)}{SSW/(n-k)}$$

$$SSB = \sum_{i=1}^k n_i (\bar{X}_i - \bar{X})^2$$

$$SSW = \sum_{i=1}^k \sum_{j=1}^{n_i} (X_{ij} - \bar{X}_i)^2$$

$$t = \frac{\bar{d}}{S_d / \sqrt{n}}$$

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

$$b = \frac{\sum_{i=1}^n (x_i - \bar{x})(Y_i - \bar{Y})}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

$$a = \bar{Y} - b\bar{x}$$

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}}$$

F distribution

F - Distribution ($\alpha = 0.05$ in the Right Tail)

df ₂	df ₁	Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
1	1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54
2	1	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385
3	1	10.128	9.5521	9.2766	9.1172	9.0135	8.9406	8.8867	8.8452	8.8123
4	1	7.7086	8.9443	6.5914	6.3882	6.2561	6.1631	6.0942	6.0410	6.9988
5	1	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725
6	1	5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2067	4.1468	4.0990
7	1	5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767
8	1	5.3177	4.4590	4.0662	3.8379	3.6875	3.5806	3.5005	3.4381	3.3881
9	1	5.1174	4.2565	3.8625	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789
10	1	4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204
11	1	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962
12	1	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964
13	1	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144
14	1	4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458
15	1	4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876
16	1	4.4940	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377
17	1	4.4513	3.5915	3.1968	2.9647	2.8100	2.6987	2.6143	2.5480	2.4943
18	1	4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563
19	1	4.3807	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227
20	1	4.3512	3.4928	3.0984	2.8661	2.7109	2.5990	2.5140	2.4471	2.3928
21	1	4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.3660
22	1	4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419
23	1	4.2785	3.4221	3.0280	2.7955	2.6400	2.5277	2.4422	2.3748	2.3201
24	1	4.2587	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002
25	1	4.2417	3.3852	2.9912	2.7587	2.6030	2.4904	2.4047	2.3371	2.2821
26	1	4.2252	3.3690	2.9752	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655
27	1	4.2100	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501
28	1	4.1960	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.2360
29	1	4.1830	3.3277	2.9340	2.7014	2.5454	2.4324	2.3463	2.2783	2.2229
30	1	4.1709	3.3158	2.9223	2.6896	2.5336	2.4205	2.3343	2.2662	2.2107
40	1	4.0847	3.2317	2.8387	2.6060	2.4495	2.3359	2.2490	2.1802	2.1240
60	1	4.0012	3.1504	2.7581	2.5252	2.3683	2.2541	2.1665	2.0970	2.0401
120	1	3.9201	3.0718	2.6802	2.4472	2.2899	2.1750	2.0868	2.0164	1.9588
*	1	3.8415	2.9957	2.6049	2.3719	2.2141	2.0986	2.0096	1.9384	1.8799

T distribution

df	0.25	0.20	0.15	0.10	0.05	0.025	0.02	0.01	0.005	0.001
1	1.000	1.376	1.963	3.078	6.314	12.71	15.89	31.82	63.66	318.3
2	0.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	22.33
3	0.765	0.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	10.21
4	0.741	0.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	7.173
5	0.727	0.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	5.893
6	0.716	0.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	5.208
7	0.711	0.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.785
8	0.706	0.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	4.501
9	0.703	0.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	4.297
10	0.700	0.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	4.144
11	0.697	0.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	4.025
12	0.695	0.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.930
13	0.694	0.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.852
14	0.692	0.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.787

Chi-square distribution

Chi-Square Distribution Table

df	Level of Significance										
	0.995	0.975	0.2	0.1	0.05	0.025	0.02	0.01	0.005	0.002	0.001
1	0.00004	0.00098	1.642	2.706	3.841	5.024	5.412	6.635	7.879	9.55	10.83
2	0.01	0.0506	3.219	4.605	5.991	7.378	7.824	9.21	10.6	12.43	13.82
3	0.0717	0.216	4.642	6.251	7.815	9.348	9.837	11.35	12.84	14.8	16.27
4	0.207	0.484	5.989	7.779	9.488	11.14	11.67	13.28	14.86	16.92	18.47
5	0.412	0.831	7.289	9.236	11.07	12.83	13.39	15.09	16.75	18.91	20.52
6	0.676	1.237	8.558	10.65	12.59	14.45	15.03	16.81	18.55	20.79	22.46
7	0.989	1.69	9.803	12.02	14.07	16.01	16.62	18.48	20.28	22.6	24.32
8	1.344	2.18	11.03	13.36	15.51	17.54	18.17	20.09	21.96	24.35	26.12
9	1.735	2.7	12.24	14.68	16.92	19.02	19.68	21.67	23.59	26.06	27.88
10	2.156	3.247	13.44	15.99	18.31	20.48	21.16	23.21	25.19	27.72	29.59
11	2.603	3.816	14.63	17.28	19.68	21.92	22.62	24.73	26.76	29.35	31.26
12	3.074	4.404	15.81	18.55	21.03	23.34	24.05	26.22	28.3	30.96	32.91
13	3.565	5.009	16.99	19.81	22.36	24.74	25.47	27.69	29.82	32.54	34.53
14	4.075	5.629	18.15	21.06	23.69	26.12	26.87	29.14	31.32	34.09	36.12
15	4.601	6.262	19.31	22.31	25	27.49	28.26	30.58	32.8	35.63	37.7
16	5.142	6.908	20.47	23.54	26.3	28.85	29.63	32	34.27	37.15	39.25
17	5.697	7.564	21.62	24.77	27.59	30.19	31	33.41	35.72	38.65	40.79
18	6.265	8.231	22.76	25.99	28.87	31.53	32.35	34.81	37.16	40.14	42.31
19	6.844	8.907	23.9	27.2	30.14	32.85	33.69	36.19	38.58	41.61	43.82
20	7.434	9.591	25.04	28.41	31.41	34.17	35.02	37.57	40	43.07	45.32

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