



SCHOOL OF COMPUTING AND ENGINEERING SCIENCES

Master of Science in Sustainable Energy Transitions  
MSET8201: Research Methodology

Date: 13<sup>th</sup> December 2023

Time: 18:00-20:30 Hours

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**Instructions:**

1. This Examination Paper consists of **FOUR** Questions.
2. Answer Question #1 (**Compulsory**) and any other **TWO** Questions.
3. Use of Calculators is **ALLOWED** in this Examination.

**Question #1 (Compulsory):**

- (a) Consider the following references collected by a Research Group while exploring a research idea. Format the references using APA referencing style. You may use the uppercase for author's names for clarity purposes only. *You will need to write short notes to justify your decision(s).*
- (i) Shah, K. U. (2018). Regulatory impact assessment for implementing energy efficient lighting standards in the small island developing state of Antigua & Barbuda. *Energy strategy reviews*, 22, 216-229. [2 Marks]
  - (ii) Halim, R. A., Kirstein, L., Merk, O., & Martinez, L. M. (2018). Decarbonization pathways for international maritime transport: A model-based policy impact assessment. *Sustainability*, 10(7), 2243. [2 Marks]
  - (iii) Shah, K. U., Roy, S., Chen, W. M., Niles, K., & Surroop, D. (2020). Application of an institutional assessment and design (IAD)-enhanced integrated regional energy policy and planning (IREPP) framework to island states. *Sustainability*, 12(7), 2765. [3 Marks]
  - (iv) Machado, J. T. M., & de Andrés, M. (2023). Implications of offshore wind energy developments in coastal and maritime tourism and recreation areas: An analytical overview. *Environmental Impact Assessment Review*, 99, 106999. [3 Marks]
  - (v) Mateo, C., Cossent, R., Gómez, T., Prettico, G., Frías, P., Fulli, G., & Postigo, F. (2018). Impact of solar PV self-consumption policies on distribution networks and regulatory implications. *Solar Energy*, 176, 62-72. [2 Marks]
- (b) Arrange the references prepared in (a) as it would appear in the listing for a Journal Publication that adopts APA style of referencing? [5 Marks]
- (c) What is the purpose of peer review? Outline and explain how peer review works from the moment an individual submits a manuscript to a journal for publication? [3 Marks]

**Question #2:**

- (a) Briefly outline the process of identification of related research idea from existing literature. [3 Marks]
- (b) What is the purpose of concept mapping in the research process? [2 Marks]

- (c) Explain any FOUR example application areas for Concept Mapping in a research process. [4 Marks]
- (d) What is a research problem? What fundamental questions do you need to consider for a research problem? [3 Marks]
- (e) What would be the basis of choosing a certain methodology for a research? Is it important to explain why the methodology was chosen? Why? [3 Marks]

**Question #3:**

In wine tasting competitions, many experts claim that the first glass of wine served sets a reference taste and that a different reference wine may alter the relative ranking of the other wines in competition. To test this claim, three wines, A, B and C, were served at a wine tasting event. Each person was served a single glass of each wine, but in different orders for different guests. At the close, each person was asked to name the best of the three. One hundred seventy-two people were at the event and their top picks are given in the table provided.

		Top Pick		
		A	B	C
First Glass	A	12	31	27
	B	15	40	21
	C	10	9	7

- (a) What is the purpose of a chi-square in a sample of a given population? What is important to note about chi-square value in a given sample? [3 Marks]
- (b) What a degree of freedom? Demonstrate the computation of the degree for an x-by-y table. [2 Marks]
- (c) Test, at the 5% level of significance, whether there is sufficient evidence in the data to support the claim that wine experts' preference is dependent on the first served wine. [10 Marks]

**Question #4:**

A research study was conducted to examine the differences between older and younger adults on perceived life satisfaction. A pilot study was conducted to examine this hypothesis. Ten older adults (over the age of 70) and ten younger adults (between 20 and 30) were give a life satisfaction test (known to have high reliability and validity). Scores on the measure range from 0 to 60 with high scores indicative of high life satisfaction; low scores indicative of low life satisfaction.

The data are presented as Older Adults {45, 38, 52, 48 and 25} and Younger Adults {34, 22, 15, 27, and 37}

- (a) What would the null-hypothesis for this study? [2 Marks]
- (b) Compute the appropriate t-test for the research study [7 Marks]
- (c) Given the null hypothesis in (a) above, do you accept or reject the null hypothesis at 0.050 significance level? Demonstrate why or why not. *The appendix in this Examination Paper has one-tail t-distribution table for your convenience* [6 Marks]

Appendices:

<b>Chi-Square Right-Tail Probability (<math>\geq \chi^2</math>)</b>										
<b>DF</b>	<b>0.995</b>	<b>0.99</b>	<b>0.975</b>	<b>0.95</b>	<b>0.9</b>	<b>0.1</b>	<b>0.05</b>	<b>0.025</b>	<b>0.01</b>	<b>0.005</b>
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	11.070	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	28.300
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	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	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	43.195	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	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	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

Numbers in each row of the table are values on a  $t$ -distribution with ( $df$ ) degrees of freedom for selected right-tail (greater-than) probabilities ( $p$ ).



df/p	0.40	0.25	0.10	0.05	0.025	0.01	0.005	0.0005
1	0.324920	1.000000	3.077684	6.313752	12.70620	31.82052	63.65674	636.6192
2	0.288675	0.816497	1.885618	2.919986	4.30265	6.96456	9.92484	31.5991
3	0.276671	0.764892	1.637744	2.353363	3.18245	4.54070	5.84091	12.9240
4	0.270722	0.740697	1.533206	2.131847	2.77645	3.74695	4.60409	8.6103
5	0.267181	0.726687	1.475884	2.015048	2.57058	3.36493	4.03214	6.8688
6	0.264835	0.717558	1.439756	1.943180	2.44691	3.14267	3.70743	5.9588
7	0.263167	0.711142	1.414924	1.894579	2.36462	2.99795	3.49948	5.4079
8	0.261921	0.706387	1.396815	1.859548	2.30600	2.89646	3.35539	5.0413
9	0.260955	0.702722	1.383029	1.833113	2.26216	2.82144	3.24984	4.7809
10	0.260185	0.699812	1.372184	1.812461	2.22814	2.76377	3.16927	4.5869
11	0.259556	0.697445	1.363430	1.795885	2.20099	2.71808	3.10581	4.4370
12	0.259033	0.695483	1.356217	1.782288	2.17881	2.68100	3.05454	4.3178
13	0.258591	0.693829	1.350171	1.770933	2.16037	2.65031	3.01228	4.2208
14	0.258213	0.692417	1.345030	1.761310	2.14479	2.62449	2.97684	4.1405
15	0.257885	0.691197	1.340606	1.753050	2.13145	2.60248	2.94671	4.0728
16	0.257599	0.690132	1.336757	1.745884	2.11991	2.58349	2.92078	4.0150
17	0.257347	0.689195	1.333379	1.739607	2.10982	2.56693	2.89823	3.9651
18	0.257123	0.688364	1.330391	1.734064	2.10092	2.55238	2.87844	3.9216
19	0.256923	0.687621	1.327728	1.729133	2.09302	2.53948	2.86093	3.8834
20	0.256743	0.686954	1.325341	1.724718	2.08596	2.52798	2.84534	3.8495
21	0.256580	0.686352	1.323188	1.720743	2.07961	2.51765	2.83136	3.8193
22	0.256432	0.685805	1.321237	1.717144	2.07387	2.50832	2.81876	3.7921
23	0.256297	0.685306	1.319460	1.713872	2.06866	2.49987	2.80734	3.7676
24	0.256173	0.684850	1.317836	1.710882	2.06390	2.49216	2.79694	3.7454
25	0.256060	0.684430	1.316345	1.708141	2.05954	2.48511	2.78744	3.7251
26	0.255955	0.684043	1.314972	1.705618	2.05553	2.47863	2.77871	3.7066
27	0.255858	0.683685	1.313703	1.703288	2.05183	2.47266	2.77068	3.6896
28	0.255768	0.683353	1.312527	1.701131	2.04841	2.46714	2.76326	3.6739
29	0.255684	0.683044	1.311434	1.699127	2.04523	2.46202	2.75639	3.6594
30	0.255605	0.682756	1.310415	1.697261	2.04227	2.45726	2.75000	3.6460
z	0.253347	0.674490	1.281552	1.644854	1.95996	2.32635	2.57583	3.2905
CI	————	————	80%	90%	95%	98%	99%	99.9%