



## SCHOOL OF COMPUTING AND ENGINEERING SCIENCES

### Master of Science in Sustainable Energy Transitions

#### MSET8201: Research Methodology

Date: 8<sup>th</sup> September 2022

Time: 2 ½ 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. You will need a Calculator to perform some of the computations

**Question #1 (Compulsory):**

- (a) Outline and explain any three purposes of citations in any research work. Give any two situations when you need not use references? [5 Marks]
- (b) Consider the following references collected by a Research Group while exploring the research idea. Format the references using APA referencing style. You can use the uppercase for authors names for clarity purposes only. *You will need to write short notes to justify your decision(s).* [6 Marks]

[1.] KIRSTEN ULSRUD, CHARLES MUCHUNKU, DEBAJIT PALIT and GATHU KIRUBI: Solar energy, mini-grids, and private sector initiatives. Publisher – Taylor and Francis Group. 1<sup>st</sup> Edition 2018. <https://doi.org/10.4324/9780429433955-1>

[2.] HYUN JIN, JULIE YU and PATRICE GEOFFRON: Solar PV market and policies. Photovoltaic Solar Energy Conversion Technologies, Applications and Environmental Impacts 2020, Pages 413-437 Publisher – Academic Press.

[3.] SCHWABE, PAUL, DAVID FELDMAN, JASON FIELDS and EDWARD SETTLE. Wind Energy Finance in the United States: Current Practice and Opportunities, National Renewable Energy Laboratory, Golden CO. NREL/TP-6A20-68227, August 2017. <https://www.nrel.gov/docs/fy17osti/68227>. Pdf.

[4.] SACHS, JEFFREY D., WING THYE WOO, NAOYUKI YOSHINO and FARHAD TAGHIZADEH-HESARY. Importance of green finance for achieving sustainable development goals and energy security. In *Handbook of Green Finance*, Pages. 3-12, Year 2019, Publisher Springer, City Singapore.

[5.] ZIEBA FALAMA R, NGANGOUM WELAJI F, HAMDA SOULOUKNGA M, KWEFEU MBAKOP F, DADJÉ A: Optimal Decision-Making on Hybrid Off-Grid Energy Systems for Rural and Remote Areas Electrification in the Northern Cameroon. *Journal of Electrical and Computer Engineering*. 2022 April 12, 2022.

[6.] HIRAO, T., OKUMURA, M., YASUDA, N., ISOZAKI, H., “Supervised automatic evaluation for summarization with voted regression model”, *Information Processing & Management*, 43 (6), 2007, Pages. 1521–1535.

- (c) Arrange the references prepared in (b) as it would appear in the listing for a Journal Publication that adopts APA style of referencing? **[3 Marks]**
- (d) What criteria did you use to arrange the references list? Why is it important to have such an arrangement for the readers? **[2 Marks]**
- (e) What is the purpose of peer review? Outline and explain how peer review works when an individual submits a manuscript to a journal for publication? **[4 Marks]**
- (f) “*The quantity of work is not important as the quality*”. Critique this statement in regard to time management during scientific research. **[2 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 four any examples application areas for Concept Mapping in a research process. **[4 Marks]**
- (d) What is a research problem? What fundamental questions do you need to be cognizant of 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]**

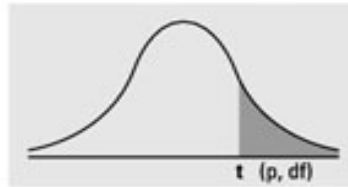
**Question #3:**

- (a) What do you understand as Ethics and Professionalism concerning a Scientific Research undertaking? **[3 Marks]**
- (b) Briefly distinguish between *internal validity* and *external validity* in a research undertaking. **[4 Marks]**
- (c) What is your understanding the central limit theorem / central tendency? Why is it important in a research process? Give some utilization examples of this theorem. **[4 Marks]**
- (d) With tangible examples, differentiate between Type I and Type II errors in a research. **[4 Marks]**

**Question #4:**

- (a) What is the sole purpose of a t-test? Explain with some tangible examples. **[2 Marks]**
- (b) Compute for the following two sets of values the t-test value: Group #1 {7, 2, 9, 8} and Group #2 {1, 2, 3, 4}? *Clearly show your working for the t-test computation.* **[8 Marks]**
- (c) Suppose you had Null hypothesis as mean of Group #1 is equal to mean of Group #2. Do you accept or reject the null hypothesis at 0.050 significance level? Demonstrate why or why not. What about 0.025 significance level. *The appendix in this Examination Paper has one-tail t-distribution table for your convenience.* **[5 Marks]**

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%