

Reg. No.

DEPARTMENT OF SCIENCES, II SEMESTER M.Sc. (Physics) END SEMESTER EXAMINATIONS, APRIL 2018 Subject: Research Methodology and Technical communication (CODE: HUM 4220)

(REVISED CREDIT SYSTEM-2017)

Time: 3 Hours	Date: 24 04 2018	MAX MARKS: 50
	Date: 24.04.2010	MAA. $MAAAS. JU$

Note: (i) Answer ALL questions.

(ii) Draw diagrams and write equations wherever necessary.

1A.	Differentiate between Type 1 and Type 2 error. Give examples.	3
1 B .	Differentiate between Probability and Non Probability sampling.	3
1C.	Explain nominal and ordinal data with an example for each.	2
2A.	A university claims that at least 50% of the students use mobile phones in class. A researcher believes that this number is too high and randomly samples 50 students to test at a significance level of 0.02. Write null and alternative hypothesis.	4
2B.	Explain Meta-analysis and Exploratory research.	3
2C.	Explain about Central limit theorem in detail.	2
3A.	Discuss the methods of collecting primary data with merits and demerits.	3
3B.	Memory capacity of 9 students was tested before and after training. State at 5 per cent level of significance whether the training was effective from the following scores: Student: $1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9$ Before: $10 \ 15 \ 9 \ 3 \ 7 \ 12 \ 16 \ 17 \ 4$ After: $12 \ 17 \ 8 \ 5 \ 6 \ 11 \ 18 \ 20 \ 3$ Use paired <i>t</i> -test.	3

3C.	Weight of 10 students is as follows: S. No.: $1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10$ Weight (kg.): 38 40 45 53 47 43 55 48 52 49 Can we say that the variance of the distribution of weight of all students from which the above sample of 10 students was drawn is equal to 20 kgs.? Test this at 5 per cent and 1 per cent level of significance.	3	
4A.	A group of seven-week old chickens reared on a high protein diet weigh 12, 15, 11, 16, 14, 14, and 16 ounces; a second group of five chickens, similarly treated except that they receive a low protein diet, weigh 8, 10, 14, 10 and 13 ounces. Test at 5 per cent level whether there is significant evidence that additional protein has increased the weight of the chickens. Use assumed mean (or $A1$) = 10 for the sample of 7 and assumed mean (or $A2$) = 8 for the sample of 5 chickens in your calculations.		
4B.	With reference to research publication, what is plagiarism?	2	
4C.	What are the various stages of research? Provide the flow diagram and explain the significance of different steps.	8	
5A.	List the following journal article source in IEEE and Harvard style of referencing.	2	
	Journal title: Optical and Quantum Electronics		
	Article title: Raman spectroscopy and low temperature electrical conductivity study of thermally evaporated CdS thin films		
	Authors: Keshav, R., Rao, A. & Mahesha, M.G. Month & Year: April 2018		
	Volume: 50 Page no.: 1 to 14		
5B.	Explain guest, gift and ghost authorships in research publication. How it violates the research publication ethics?	3	
5C.	Read the following paragraph of scientific article and answer the questions.	5	
	Photovoltaic device based on inorganic–organic hybrid perovskite structured materials have been one of the brightest spotlights in the energy-conversion research field in recent years. However, due to their inherent properties and the architecture of the fabricated device, many defects trap states or carrier transport barriers are present at the interfaces between each functional layer and at the grain boundaries of the perovskite. These defects cause undesirable phenomena such as hysteresis and instability in the perovskite solar cells, which has slowed their commercialization. To address these issues, intensive research effort has been devoted recently to the development of passivation materials and approaches that can reduce the amount of interface and surface defect states in perovskite solar cells. Here, we have reviewed the state of the research progress in the development of passivation of different interfaces in the perovskite solar cell, including the interface (a) between transport material and perovskite; (c) between the perovskite grains (grain boundaries); (d) between the perovskite and hole transport layer; (e) between the hole transport layer and electrode, and (f) between the electrode material and atmospheric environment.		

Perovskite hybrid solar cells are in vogue in solar cell research. Dye-sensitized solar (DSS) cells, thin film solar cell and silicon solar cell, among others, owing to their efficiencies that are comparable to crystalline Si solar cells and ease of fabrication by a low-temperature solution technique. Although perovskite solar cells have been accounted for to exhibit enhanced output of about 21% from about 9.7%, limited researches have been conducted to find out their low stability that impedes outdoor applications. The issue of degradation of perovskite and the stability of perovskite solar cells should be addressed for good reproducibility and long-life time with high conversion efficiencies.

Sources: Materials Today Energy Volume 7, March 2018, Pages 267-286

Renewable and Sustainable Energy Reviews Volume 81, Part 2, January 2018, Pages 2812-2822

- (i) From above paragraphs, identify the research gap.
- (ii) Based on above paragraphs, write two research objectives.
- (iii) What is the impact of perovskites in energy technology?
- (iv) What is the advantage of DSS and thin film solar cells?
- (v) Identify four keywords which are suitable to represent the above paragraphs.