Note: (i) Answer **ALL** questions
       (ii) **Draw diagrams**, and write equations wherever necessary
       (iii) Any **missing data** may be suitably assumed

Question		**Marks**
1A	What are the objectives of research? Explain its role in nation building	**6**
1B	Describe any 4 types of research with examples	**4**
2A	Differentiate between Type 1 and Type 2 error in hypothesis testing. Give examples.	**4**
2B	Briefly explain the following i) Simple random sampling ii)Stratified random sampling iii) systematic random sampling and iv) Cluster sampling	**4**
2C	What is Mendeley? What are its salient features?	**2**
3A	A study was conducted involving 10 students to investigate the association between Mathematical Physics and Computational Physics tests. The question arises here; is there a relationship between the degrees gained by the 10 students in Mathematical Physics and Computational Physics tests? Notes: the marks out of 30	**5**

Students	1	2	3	4	5	6	7	8	9	10
Mathematical Physics	20	23	8	29	14	12	11	20	17	18
Computational Physics	20	24	11	24	23	15	12	23	21	25

	Calculate the correlation coefficient and give your remarks. Also, find the equation for the regression line (Line of best fit).	
3B	The following contingency table shows a random sample of 321 fatally injured passenger vehicle drivers by age and gender.	**5**

Gender	AGE					
	16-20	21-30	31-40	41-50	51- 60	61 and older
Male	32	51	52	43	28	10
Female	13	22	33	21	10	6

At $\alpha = 0.05$[Critical value of Chi square=11.07], Perform the **Chi-Square Independence Test** and conclude whether the drivers' ages are related to gender in such accidents?

4A	Describe IEEE and Harvard styles of referencing. Correct the mistakes in the following references and arrange it properly as per the Harvard style.	**4**

1. Jeganath K., Choudhari Jnaneshwar N., Pai G.S., Rao A., Raviprakash, Y., Role of substrate temperature on spray pyrolysed metastable π -SnS thin films. Mater. Sci. Semicond. Process. 113(5), 105050-105058, 2020.

2. Recent developments and viable approaches for high-performance supercapacitors using transition metal-based electrode materials. Pramitha A, Raviprakash Y. , J Energy Storage, 2022; 49(1), 456-465

3. Choudhari NJ, Raviprakash Y, George SD, Murari MS. Effect of stacking sequence on the structural ordering and phase formation in the sequentially deposited copper zinc tin sulfide thin films. Int J Energy Research 2022, 43(5), 1093-1106

4B	Explain the process of identifying the right journals for publication of your manuscript using various criteria/tools of selection.	**3**
4C	**Read the following paragraph of scientific article and answer the questions given at the end**	**3**

Tin monosulfide (SnS) is considered as a promising semiconductor material for optoelectronic applications because of its favourable direct band gap (1.2-1.6 eV) and its higher optical absorption coefficient over 10^4 cm^{-1} [1, 2]. Moreover, SnS contains environmentally benign and abundant constituent elements [3]. π-SnS thin films attracted researchers interest due to its unique structural property and amenability on the usage of a wide range of optoelectronic applications. π-SnS thin films have been synthesised by various physical and chemical deposition techniques such as atomic layer deposition [21], chemical bath deposition [16], thermal evaporation [22], magnetron sputtering [23], and spray pyrolysis [24].

Bilousov et al., [21] investigated the role of H_2S dose and the substrate temperature on the formation of π-SnS using atomic layer deposition. They observed phase conversion from π-SnS to orthorhombic SnS at higher substrate temperatures. π-SnS based thin film solar cells fabricated by Garcia-Angelmo et al., [16]. Their results concluded that heating the material at suitable temperature and ambient pressure for the optimum duration is essential to improve the solar cell performance. Hara et al., [22] synthesised SnS thin films at substrate temperature of 250-350 °C using thermal evaporation. The mixed-phase formation of π-SnS was observed on XRD pattern along with orthorhombic SnS phase. The π-SnS phase ratio was enhanced at lower substrate temperatures. Moreover, the synthesis of high crystalline π-SnS thin films using facile and cost-effective techniques is the need of the hour. Among the various available techniques, spray pyrolysis has the capability of producing thin films on large-area in an ambient atmosphere which facilitates industrial-scale production. Hence, it is important to investigate the role of substrate temperature on the formation of π-SnS to get a single π-phase with higher crystallinity using a cost-effective technique. In this article, we report the synthesis parameters of spray pyrolysis deposition to obtain π-SnS. Role of substrate temperature on the phase decomposition of π-SnS and its effect on various physical properties is discussed in details using several characterization methods.

i   From above paragraphs, identify the research gap.
ii   Based on above paragraphs, write two research objectives.
iii.   Identify four keywords which are suitable to represent the above paragraphs

5A	How an abstract of a good thesis/article should be? Explain the rule of 10.	**4**
5B	Describe the various types of authorship including ghost author and gift author	**4**
5C	What is Altmetric? What are the metrics you can gather from it?	**2**