Reg.No. | | | | | | | | | |

**DEPARTMENT OF SCIENCES, II SEMESTER M.Sc. (Physics)**
**END SEMESTER EXAMINATIONS, MAY/JUNE 2023**
RESEARCH METHODOLOGY AND TECHNICAL COMMUNICATION [PHY 5257]
**(CHOICE BASED CREDIT SYSTEM - 2020)**

Time: 3 Hours                    Date: 29-05-2023                    MAX. MARKS: 50

Note    (i) Answer **ALL** questions

(ii) Draw diagrams, and write equations wherever necessary

(iii) Any **missing data** may be suitably assumed

| | | Marks | CO | BL |
|---|---|---|---|---|
| 1A | Explain the purpose and significance of research with suitable examples | 5 | 1 | 2 |
| 1B | What is case study method? Mention its limitations. | 3 | 1 | 2 |
| 1C | Explain the procedure for hypothesis testing using a flow chart | 2 | 1 | 2 |
| 2A | Compare the four levels of measurement scales with suitable examples | 5 | 2 | 2 |
| 2B | Find the mean age of the students for the following type of set of data | 3 | 2 | 3 |
| 2C | What are the four types in probabilistic method of sampling? | 2 | 2 | 2 |
| 3A | Find the equation of the regression line/line of best fit for the given set of data. | 5 | 2 | 3 |

**2B table:**

| Age of students | Number of students |
|---|---|
| $14 \leq x < 18$ | 95,000 |
| $18 \leq x < 20$ | 1,32,000 |
| $20 \leq x < 22$ | 1,55,000 |
| $22 \leq x < 25$ | 98,000 |
| $25 \leq x < 30$ | 46,000 |
| $30 \leq x < 35$ | 25,000 |

**3A table:**

| $x$ | $y$ |
|---|---|
| 1 | $-5$ |
| 2 | $-3$ |
| 3 | -1 |
| 4 | 0 |
| 5 | 2 |

| | |
|---|---|
| 6 | 4 |
| 7 | 6 |
| 8 | 7 |

| | | | | |
|---|---|---|---|---|
| 3B | Using the relevant formulae, briefly explain the three main measures of dispersion | 3 | 2 | 2 |
| 3C | What is H-index and Cite Score? How they are calculated? | 2 | 3 | 2 |
| 4A | The following contingency table shows a random sample of fatally injured passenger vehicle drivers by age and gender. | 5 | 2 | 3 |

| Gender | AGE | | | | | |
|---|---|---|---|---|---|---|
| | 16-20 | 21-30 | 31-40 | 41-50 | 51- 60 | 61 and older |
| Male | 65 | 51 | 52 | 43 | 28 | 10 |
| Female | 30 | 22 | 33 | 21 | 10 | 8 |

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?

| | | | | |
|---|---|---|---|---|
| 4B | What is null hypothesis? Distinguish between type I and type II errors in hypothesis testing | 3 | 1 | 2 |
| 4C | Briefly explain the features of Mendeley and Turnitin software. | 2 | 3 | 2 |
| 5A | Describe IEEE and Harvard styles of referencing. Convert the following references given in IEEE style to the Harvard style. | 5 | 3 | 2 |

[1] Liu R, Liu C and Fan S 2017 A photocapacitor based on organometal halide perovskite and PANI/CNT composites integrated using a CNT bridge *J. Mater. Chem. A* **5** 23078–84

[2] Bati A S R, Zhong Y L, Burn P L, Nazeeruddin M K, Shaw P E and Batmunkh M 2023 Next-generation applications for integrated perovskite solar cells *Commun. Mater.* **4** 1–24

[3] Narayanan S, Parikh N, Tavakoli M M, Pandey M, Kumar M, Kalam A, Trivedi S, Prochowicz D and Yadav P 2021 Metal Halide Perovskites for Energy Storage Applications *Eur. J. Inorg. Chem.* **2021** 1201–12

| | | | | |
|---|---|---|---|---|
| 5B | A Technical article should essentially contain what? Explain the role of each section in it. | 3 | 3 | 2 |
| 5C | What is the necessity of a covering letter to the editor? What should it contain? | 2 | 3 | 2 |

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