Reg. No. : ....

Name : ....

Ph.D. ENTRANCE EXAMINATION 2023

FACULTY OF APPLIED SCIENCES AND TECHNOLOGY

OPTOELECTRONICS

Time : 3 Hours   Max. Marks : 100

Instructions :

1) Answer **any ten** questions each from Section **A** and **B.**
2) Each question carries **5** marks.
3) No additional Answer sheets will be provided.
4) Candidates should clearly indicate the section, Question number in the answer booklet.

Section – A

Research Methodology

Answer any **ten** questions. Each question carries **5** marks.

1. Explain the importance of scientific development on society.

2. Give a brief appreciation of a scientific article that inspired you.

3. Explain the objectives of research.

4. Distinguish between interpretation and deduction.

5. How do you perform the statistical testing of hypothesis?

6. Explain the terms, "patterns and trends".

7. Explain the importance of estimation of errors.

8. Discuss the use of multimedia in a scientific presentation.

9. Comment on the success of the recent Chandrayan —3 missions.

10. Distinguish between absolute errors and relative errors.

11. Give a short account of the historical development of quantum mechanics.

12. List out the ethics to be adopted in doing research.

13. Explain the need of research survey and the role of review article in choosing a research problem.

14. List out any five reputed international journals with the corresponding publishers.

15. State the major research contributions of the scientists who have been awarded the Physics Nobel prize in 2022.

(10 × 5 = 50 Marks)

Section – B

Answer any **ten** questions. Each question carries **5** marks.

1. Obtain the relation between beta and gamma functions.

2. Starting from D'Alembert's principle develop the Lagrangian equation.

3. What are Pauli spin matrices and state the properties of these matrices?

4. Deduce expressions for reflection coefficient and transmission coefficient at an interface with a perfectly conducting boundary.

5. What is skin depth? Obtain an expression for skin depth.

6. Explain the specialties of magic numbers in nuclei.

7. Describe the connection between statistics and thermodynamics of a thermodynamical system.

8. What is Hall effect? Obtain an expression for Hall coefficient.

9. With a neat diagram explain the different normal vibrational modes of water molecule.

10. Explain the Lande interval rule and where it is applied?

11. What are Einstein's coefficients? Obtain the relation between them.

12. Evaluate y(4) using Newton's backward difference interpolation for the data points (0,1),(l,2),(2, 1) and (3, 10).

13. What is Schmitt trigger? Explain how Schmitt trigger can be used for wave shaping purposes with the help of a circuit diagram.

14. Explain with circuit diagram, the operation of a monostable multivibrator and sketch the input and output waveforms.

15. Explain the operation of J-K flip flop giving truth table and timing diagram.

——————— **(10 $\times$ 5 = 50 Marks)**