Reg. No. : ....

Name : ....

Ph.D. ENTRANCE EXAMINATION, NOVEMBER 2022

FACULTY OF APPLIED SCIENCE 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

I.   Answer any **ten** questions. All questions carry equal marks.

1.   Explain the various steps adopted in research.

2.   Describe various ethical issues involved in research.

3.   Define hypothesis and state the characteristics of a good hypothesis.

4.   Distinguish the terms primary and secondary data.

5.   Explain why error analysis is an inevitable component in research.

6.   What are the characteristics of scientific writing?

7.   What are the components of a research paper?

8. Explain the importance of references in scientific research.

9. What is meant by the term "salami slicing" in research?

10. What are the advantages of the software "Mendeley" while referencing?

11. Discuss some software tools to check plagiarism.

12. Write a short note on copyright of a publication.

13. What are predatory publications? Explain its disadvantages.

14. Explain the need for patenting scientific research.

15. Explain the term "H Index" and its significance.

(10 × 5 = 50 Marks)

Section – B

Optoelectronics

II. Answer any **ten** questions. All questions carry equal marks.

1. Explain the working of a laser resonator and show how the modes are obtained.

2. Discuss the working of a Ruby laser.

3. Discuss the threshold condition for the laser action.

4. Write a short note on two level laser system and explain why lasing action is not possible in two level system.

5. What are single mode fibres and explain its characteristic parameters?

6. Distinguish between spatial coherence and temporal coherence.

7. Explain self-phase modulation and self-focussing modulation.

8. Derive the relation between the various Einstein's coefficients of absorption and emission of radiation.

9. Distinguish between direct and indirect band gap semiconductors with the help of E-k diagram.

10. Discuss the variation of Fermi Dirac distribution curve with temperature.

11. Explain the physical origin of effective mass with respect to band theory of solids.

12. Discuss paramagnetic behaviour of conduction electrons.

13. Write about quantum confinement and significance of quantum confined structures as lasing media.

14. Explain the term quantum yield.

15. Discuss the variation of polarizabilty with frequency.

(10 $\times$ 5 = 50 Marks)

_____