

Reg. No. :

Name :

Ph.D. ENTRANCE EXAMINATION, NOVEMBER 2022

FACULTY OF APPLIED SCIENCE AND TECHNOLOGY

NANOSCIENCE AND NANOTECHNOLOGY

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. All Questions carry equal marks.

1. How objectives of research is identified?
2. What is the necessity for a well-defined methodology for executing research?
3. Compare and contrast conceptual research and empirical research.
4. What is role of literature review in defining a research problem?
5. Distinguish the term primary and secondary data.
6. How review articles are helpful in research?
7. Mention some of the online resources helpful for research.

8. Discuss research design with its components.
9. Explain the terms citation and bibliography.
10. What are limitations of sampling?
11. Categorize the sources of data and mode of collection with examples.
12. Describe various ethical issues involved in research.
13. What is plagiarism? Discuss some software tools to check plagiarism.
14. What is the importance of error analysis in research?
15. Explain a method for curve fitting.

(10 × 5 = 50 Marks)

Section – B

Nanoscience and Nanotechnology

- II. Answer any **ten** questions. All Questions carry equal marks.
1. State and prove Ehrenfest's theorem.
 2. Express Schrodinger wave equation in momentum representation stating the significance of momentum wave function.
 3. Obtain the wave function and energy of a particle along one dimension in a square well potential.
 4. Explain X ray diffraction analysis by Laue method.
 5. Discuss the variation of Fermi Dirac distribution curve with temperature.
 6. Explain the physical origin of effective mass with respect to band theory of solids.
 7. Discuss the principle behind Hall Effect. Also mention its applications.
 8. Explain Langevin's theory of diamagnetism.
 9. Differentiate between Type I and Type II superconductors with example.
 10. Discuss various Top-Down approaches for the synthesis of nano-materials.

11. Explain the principle and working of TEM.
12. Distinguish between physical vapour deposition and chemical vapour deposition for the synthesis of nano-structured film.
13. Explain the electronic structure of carbon nano-tubes.
14. Explain the magnetic applications of nano-composites.
15. Discuss sol gel technique. Mention the applications of sol gel derived nano-structured thin films.

(10 × 5 = 50 Marks)
