

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, MARCH 2020

(CUCSS)

Physics

PHY 4E 17—ADVANCED CONDENSED MATTER PHYSICS

(2017 Admission onwards)

Time : Three Hours

Maximum : 36 Weightage

Section A

*(12 Short questions, each answerable within 5 minutes)**Answer all questions, each carries weightage 1.*

1. What are magnons ?
2. Write a note on Frenkel excitons.
3. What are superlattices ?
4. Distinguish between ternary and quaternary groups.
5. What is fatigue ?
6. What are ductile and brittle fractures ?
7. Explain ionic conductivity etching.
8. What is nucleation in thin film growth ?
9. Mention any *four* optoelectronic applications of thin films.
10. Explain energy levels of quantum dots.
11. Distinguish between quantum wires and quantum dots.
12. Write a note on applications of nanotechnology in (a) Medicine ; (b) Ceramic industry.

(12 × 1 = 12 weightage)

Section B

*(4 Essay questions, each answerable within 30 minutes).**Answer any two questions, each question carries weightage 6.*

13. Discuss how Hartree Fock approximation can be used to analyze the interacting electron gas. Give its limitations.
14. Explain the physics of alloy formation with phase diagram.

Turn over

15. Discuss the different types of defects in solids.
16. Give the principle of the solution deposition technique for thin film preparation. With the help of a neat diagram, describe the experimental set up for this method.

(2 × 6 = 12 weightage)

Section C

(6 Problem questions, each answerable within 15 minutes)

*Answer any **four** questions, each question carries weightage 3.*

17. Write a note on Bloch and Wannier representations.
18. Write a note on crack initiation and propagation in materials.
19. Write a note on quantum well structures in alloys.
20. Explain one method of nanotube synthesis.
21. Write a note on size and dimensionality effects in nanostructures.
22. Explain briefly the vapour deposition technique.

(4 × 3 = 12 weightage)