

## 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)