QP Code:ECH41-2 **(Pages:2)**

Reg No : ..... Name : .....

MAR ATHANASIUS COLLEGE OF ENGINEERING, KOTHAMANGALAM

(Govt. Aided Autonomous Institution)

Fourth Semester B.Tech. Degree Examination, May, 2026

Course Code: B24ECH41

Course Name: NANO ELECTRONICS

Max. Marks: 100 Duration:3 Hours

PART - A: 30 Marks (10 Qns x 3 Marks)

Answer all questions

1. Define density of states (DOS) in a semiconductor.
2. What is quantum mechanical coherence?
3. What are the basic steps involved in the Chemical Vapour Deposition process?
4. Define self-assembly in nanotechnology.
5. Explain dynamic light scattering (DLS)?
6. What is the principle of an electron microscope?
7. Why are dopants placed away from the channel in modulation-doped quantum wells?
8. Define a two-dimensional electronic system (2DES).
9. Discuss the process of modulation doping in MODFETs?
10. How does an applied electric field affect absorption in a quantum well?

PART - B: 70 Marks (5 Qns x 14 Marks)

Answer any One full question from each module.

Module 1

11. Explain the basic properties of two-dimensional semiconductor nanostructures with reference to electron confinement and density of states.

OR

12. Describe the structure and classification of carbon nanotubes based on chirality and diameter.

Module 2

13. a) Explain the fabrication of nanoparticles using grinding with iron balls. Also discuss the advantages and limitations. (7 marks)

    b) Explain Laser Ablation. (7 marks)

OR

14. a) Discuss any two methods of nano layer fabrication. (7 marks)

    b) Explain evaporation as a Physical Vapour Deposition method. (7 marks)

Module 3

15. a) Describe the principle of X-ray diffraction and derive Bragg's law. (7 marks)

    b) Explain the advantages, limitations, and applications of Transmission Electron Microscope in nanomaterials characterization. (7 marks)

OR

16. Explain the principle, construction, and working of the Scanning Electron Microscope (SEM).

Module 4

17. Explain the structure and working of a MOSFET with a neat diagram.

OR

18. Discuss the energy band structure of a superlattice and explain how it differs from that of bulk semiconductors.

Module 5

19. Describe the structure and working of a quantum dot laser with suitable diagrams.

OR

20. Explain the resonant tunnelling effect with the help of energy band diagrams. Discuss its importance in nanoelectronic devices.

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