

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2023**(2020 SCHEME)****Course Code : 20ECT292****Course Name: Nano Electronics****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. List the limitations of conventional microelectronics.
2. Illustrate Schrodinger 's equation in connection with low dimensional structure.
3. Explain grinding with iron balls used for the fabrication of nano particle.
4. Compare dry and wet etching process.
5. Describe the significance of characterization of nano particles.
6. Explain the principle of operation of STM.
7. Describe the significance of modulation doped quantum wells.
8. Explain hot electrons in nano structures.
9. List the properties of graphene.
10. Illustrate why MODFETs are called high electron mobility transistors.

PART B***(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. a) Describe characteristic lengths in mesoscopic systems. (5)
- b) Differentiate quantum well, quantum wire and quantum dot with suitable explanations. (9)

OR

12. a) Derive density of states function with respect to different dimensions. (8)
- b) Illustrate parabolic and triangular quantum well. (6)

MODULE II

13. Illustrate PVD and Sputtering techniques used in nano layer formation with neat sketches. (14)

OR

14. a) Describe all possible methods for the formation of SiO₂ from Si. (7)
b) Illustrate CVD process with neat sketch. (7)

MODULE III

15. Describe the principle of scanning tunnelling microscope with schematic diagram? (14)

OR

16. Illustrate the working of XRD analyzer and how it can be used to analyze a crystal. (14)

MODULE IV

17. a) Explain the concept of Coulomb Blockade effect? List out the conditions to be met in order to observe coulomb blockade? (10)
b) Describe Aharonov-Bohm effect. (4)

OR

18. a) Derive Kronig - Penney model of super lattice with necessary band diagrams. (10)
b) Describe Shubnikov-de Hass effect. (4)

MODULE V

19. a) Describe the working of single electron transistor. (7)
b) Illustrate Quantum Hall Effect (QHE). (7)

OR

20. Explain the principle of operation of a quantum dot laser with structural details. (14)
