

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
Eighth Semester B.Tech Degree Supplementary Examination August 2021

**Course Code: EC402**  
**Course Name: NANO ELECTRONICS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- |   |   |      |
|---|---|------|
| 1 | a) Explain ion implantation method of nanomaterial deposition.                                | (10) |
|   | b) DC sputtering cannot be used for fabricating non conducting layers. Justify the statement. | (5)  |
| 2 | a) Explain laser ablation technique used for the fabrication of nanolayers.                   | (5)  |
|   | b) Explain the features of triangular and parabolic quantum wells.                            | (10) |
| 3 | a) Explain any two characteristic lengths associated with mesoscopic systems.                 | (5)  |
|   | b) Derive the expression for density of states in a 1D nano structure.                        | (10) |

**PART B**

*Answer any two full questions, each carries 15 marks.*

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|---|---|------|
| 4 | a) Explain the working principle of Atomic Force Microscope.                        | (10) |
|   | b) Explain modulation doping and band formation in modulation doped heterojunction. | (5)  |
| 5 | a) Differentiate between multiple quantum well and superlattice.                    | (5)  |
|   | b) Explain Kronig Penney model of superlattice and the concept of zone folding.     | (10) |
| 6 | a) Explain the working principle of Transmission Electron Microscopy.               | (10) |
|   | b) Compare electron and optical microscopes.  | (5)  |

**PART C**

*Answer any two full questions, each carries 20 marks.*

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|---|---|------|
| 7 | a) Explain resonant tunnel effect and the operation of resonant tunnel diode.   | (10) |
|   | b) With the aid of energy band diagram, explain why MODFETs are high electron mobility transistors                    | (6)  |
|   | c) Explain the principle of NEMS.   | (4)  |
| 8 | a) Explain parallel transport in quantum structures and various scattering mechanisms associated with this transport. | (10) |

- b) Explain the formation of Landau levels and degeneracy associated with these levels. (4)
- c) Explain Integer Quantum Hall effect. (6)
- 9 a) Explain Coulomb blockade effect and the two conditions to be satisfied in order to observe Coulomb blockade effect. (10)
- b) Explain the principle of quantum well subband photodetector. (6)
- c) Explain the concept of hot electrons. (4)

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