Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech S4 (Hons.) Degree Examination May 2025 (2023 Admn)

**Course Code: ECT 292**

**Course Name: NANOELECTRONICS**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***(Answer all questions; each question carries 3 marks)*** Marks

| | | | |
|---|---|---|---|
| 1 | | Explain Quantum dots in nanoelectronics. | 3 |
| 2 | | Explain the concept of quantum mechanical coherence. | 3 |
| 3 | | What is physical vapour deposition (PVD) method in nano structure fabrication? | 3 |
| 4 | | With suitable example explain precipitation of quantum dots. | 3 |
| 5 | | Explain the specimen interactions takes place in Scanning Electron Microscopy (SEM). | 3 |
| 6 | | Differentiate between Atomic Force Microscopy (AFM) and Scanning Electron Microscopy (SEM). | 3 |
| 7 | | Compare Multiple quantum wells and modulation doped quantum wells. | 3 |
| 8 | | Explain coulomb blockade effect. | 3 |
| 9 | | What is HOT electron transistor? | 3 |
| 10 | | With necessary diagrams explain quantum dot laser. | 3 |

**PART B**

***(Answer one full question from each module, each question carries 14 marks)***

**Module -1**

| | | | |
|---|---|---|---|
| 11 | a) | Explain characteristics length in Mesoscopic systems. | 10 |
| | b) | What all are the limitations of conventional microelectronics? | 4 |
| 12 | a) | Synthesise the equations for density of states (DOS) of 1D and 2D structures. | 10 |
| | b) | Compare square and parabolic quantum wells. | 4 |

**Module -2**

| | | | |
|---|---|---|---|
| 13 | a) | With neat diagrams explain chemical vapour deposition. | 7 |
| | b) | Explain Ion implantation process. | 7 |
| 14 | a) | Explain the reduction method for nanofabrication. | 7 |
| | b) | Describe the process of sol gel formation. | 7 |

**Module -3**

| | | | |
|---|---|---|---|
| 15 | a) | Explain characterisation using Scanning Tunneling Microscopy (STM). | 14 |
| 16 | a) | Explain X-Ray Diffraction analysis. | 14 |

**Module -4**

| | | | |
|---|---|---|---|
| 17 | a) | Model the superlattice structures using Kronig penney equations. | 10 |
| | b) | Explain Resonant tunnelling transport. | 4 |
| 18 | a) | Explain electron scattering mechanisms. | 10 |
| | b) | Explain the effect of high magnetic field on a crystal. | 4 |

**Module -5**

| | | | |
|---|---|---|---|
| 19 | a) | With necessary diagrams explain MODFET. | 7 |
| | b) | Explain single electron transistors. | 7 |
| 20 | a) | What is the concept of quantum well laser? | 7 |
| | b) | Explain quantum dot LED. | 7 |

***