

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
EIGHTH SEMESTER B.TECH DEGREE EXAMINATION, MAY 2019

Course Code: EC402
Course Name: NANOELECTRONICS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

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| 1 | a) Explain the different characteristic lengths in a mesoscopic system? | (10) |
| | b) Describe parabolic quantum well. | (5) |
| 2 | a) Starting from Schrodinger equation, show that the density of states in a 1D semiconductor material is directly proportional to $1/\sqrt{E}$ | (10) |
| | b) Differentiate between dry and wet oxidation methods. | (5) |
| 3 | a) Explain sol-gel process for fabrication of nano-particles | (9) |
| | b) Brief up laser ablation method for nano material deposition with significance on RHEED screen. | (6) |

PART B

Answer any two full questions, each carries 15 marks.

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| 4 | a) Explain with neat diagram different types of specimen interactions taking place in a sample during SEM. | (10) |
| | b) Explain Multiple Quantum Wells and its different types with neat diagrams. | (5) |
| 5 | a) Explain Kronig-Penney model for superlattice and zone folding. | (10) |
| | b) Explain the concept of modulation doping. | (5) |
| 6 | a) Explain the working of XRD analyzer and how it can be used to analyze a crystal. | (10) |
| | b) Explain the working principle of Atomic Force Microscope. | (5) |

PART C

Answer any two full questions, each carries 20 marks.

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| 7 | a) Write notes on the following scattering mechanisms (a) Electron-phonon scattering (b) Impurity scattering (c) Surface roughness scattering (d) Inter sub band scattering | (10) |
| | b) Explain the principle of carbon nano tube transistors and its three different types. | (6) |
| | c) List the advantages of heterojunction quantum wells in MODFETs? | (4) |

- 8 a) Illustrate the principle of operation of Resonant tunnelling diode. (8)
- b) Explain the Aharonov-Bohm effect to induced phase variations in electron waves with the application of magnetic field with the help of diagrams and equations.. (8)
- c) Explain the concept of hot electrons. (4)
- 9 a) Explain the concept of coulomb blockade. Obtain the conditions to be fulfilled to observe single electron effect. (10)
- b) Explain the device structure and working of DH laser. (5)
- c) Write notes on NEMS. (5)

