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

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.***

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.***

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)

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