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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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

EIGHTH SEMESTER B.TECH DEGREE EXAMINATION(S), OCTOBER 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 sol-gel process and how you can fabricate a quantum wire using the technique.	(10)
	b)	Explain quantum mechanical coherence.	(5)
2	a)	Starting from Schrodinger equation, show that the density of states in a 2D nano material is independent of energy.	(10)
	b)	Explain the precipitation of quantum dots.	(5)
3	a)	Explain the different types of PVD techniques.	(10)
	b)	Explain any ten properties of graphene.	(5)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	Define the term Photoluminescence. Discuss with neat diagrams PL spectroscopy in detail.	(10)
	b)	Compare electron and optical microscope.	(5)
5	a)	Illustrate the working of SEM .Explain the different specimen interactions.	(10)
	b)	Explain how conductivity is increased in 2D electron gas in AlGaAs-GaAs structure.	(5)
6	a)	Compare MQW with superlattice structure.	(8)
	b)	Explain modulation doping and why mobility of carrier increases in modulation doped structure.	(7)

PART C

Answer any two full questions, each carries 20 marks.

7	a)	Derive Landauer Formula and explain its significance.	(9)
	b)	Explain Landau levels and its variation with magnetic field.	(6)
	c)	Explain perpendicular transport in quantum structure.	(5)

8	a)	Explain the Shubnikov-de Hass effect of magnetic fields on the electronic and transport properties of the 2D systems.	(10)
	b)	Explain Resonant Tunnel Effect and the operation of Resonant Tunnel Diodes.	(10)
9	a)	Illustrate the working of a quantum well optical modulator.	(8)
	b)	With the help of a neat schematic diagram explain MODFETs.	(8)
	c)	Explain the concept of hot electrons.	(4)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Eighth semester B.Tech degree examinations, September 2020

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 de-Broglie wavelength & Screening length in mesoscopic systems.	(5)
	b)	Explain parabolic & triangular quantum wells with neat diagrams.	(10)
2	a)	Explain the process of Physical Vapour Deposition in the fabrication of nano-layers.	(7)
	b)	Explain laser ablation.	(8)
3	a)	Explain Quantum wells, wires & dots & compare each.	(5)
	b)	Explain the process of grinding with iron balls in the fabrication of nanoparticles.	(5)
	c)	Write short notes on: i) Carbon nanotubes ii) Sol-gel process	(5)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	Differentiate between electron & optical microscope.	(4)
	b)	Explain the principle of Scanning Tunnelling Microscope with neat diagrams.	(6)
	c)	Explain X-Ray Diffraction analysis.	(5)
5	a)	Write notes on Modulation doped hetero-junctions.	(5)
	b)	Explain SEM with suitable diagrams.	(10)
6	a)	Compare STM and AFM.	(3)
	b)	Write short notes on PL & UV spectroscopy.	(7)
	c)	Explain the structure & energy band diagram of MOSFET.	(5)

PART C

Answer any two full questions, each carries 20 marks.

7	a)	Explain the resonant tunnelling effect with neat diagrams.	(6)
	b)	Explain Coulomb blockade in nanostructures.	(6)
	c)	Derive Landauer formula for Quantum transport in nanostructures.	(8)
8	a)	Explain the structure of Single electron transistor with neat diagrams.	(10)
	b)	Write short notes on i) Quantum dot Laser ii) CNT transistors.	(10)
9	a)	Explain the electron Scattering mechanism for parallel transport in semiconductor nanostructures.	(10)
	b)	Explain the structure of MODFET.	(6)
	c)	Write short notes on i) NEMS.	(4)

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