



BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Tech.(RA)-2023

Course Name – Nano Electronics

Course Code - PEC-ECR601B

(Semester VI)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Identify the equation, which is the counterpart of Schrödinger equation in classical mechanics
 - a) mass conservation
 - b) momentum conservation
 - c) energy conservation
 - d) number of particles conservation
- (ii) Identify the element with one dimension in Nano range and the other two dimensions in large range
 - a) Micro-material
 - b) Quantum wire
 - c) Quantum well
 - d) Quantum dot
- (iii) Select the condition of the melting point of particles in nano form
 - a) Increases
 - b) Decreases
 - c) Remains same
 - d) Increases then decreases
- (iv) Identify the person who introduced about nanotechnology
 - a) Albert Einstein
 - b) Newton
 - c) Gordon E. Moore
 - d) Richard Feynman
- (v) Identify the processes of materials was not described as Nanotechnology
 - a) Separation
 - b) Creation
 - c) Processing
 - d) Consolidation
- (vi) Select the size of atoms from the following
 - a) 0.01 nm
 - b) 0.1 nm
 - c) 10 nm
 - d) 1 nm
- (vii) Identify the reason why NMOS are better than PMOS
 - a) Better noise immunity
 - b) faster
 - c) TTL compatible
 - d) better drive capability
- (viii) Density of states in quantum mechanics is defined as

- a) The probability of finding a particle at a given position b) The energy levels available to a particle in a system
- c) The rate of change of particle velocity d) The distribution of particles in space
- (ix) Express the main issue obtained in system integration related to interconnects
- a) Decreasing interconnect resistance b) Increasing interconnect capacitance
- c) Decreasing interconnect length d) Increasing interconnect delay
- (x) Indicate the primary reason for the adoption of FinFETs over traditional planar MOSFETs
- a) Higher leakage current b) Lower gate control
- c) Better gate control d) Lower transistor density
- (xi) Indicate the key advantage of Vertical MOSFETs in terms of scaling
- a) Higher gate capacitance b) Lower gate control
- c) Higher on-off ratio d) Lower gate capacitance
- (xii) The full form of DIBL indicates as
- a) Drain induced barrier level b) Drain indirect barrier lowering
- c) Drain induced barrier lowering d) None of these
- (xiii) CNT is indicated as
- a) Non toxic b) Toxic
- c) Very Safe d) Not having graphene
- (xiv) Identify most promising applications of the CNT
- a) Paper batteries b) Solar cells
- c) Space elevators d) Stab proof
- (xv) Identify that Quantum dots can be used in
- a) Crystallography b) Optoelectronics
- c) Mechanics d) Quantum physics

Group-B

(Short Answer Type Questions)

3 x 5=15

2. State and explain Moore's Law. (3)
3. Discuss the advantage of double gate MOSFET. (3)
4. Explain the various applications of quantum dots. (3)
5. Explain the physical significance of wave function. (3)
6. Explain the solution of the equation $P \frac{\sin \alpha a}{\alpha a} + \cos \alpha a = \cos k a$ when $P \rightarrow 0$. (3)

OR

Explain the solution of the equation $P \frac{\sin \alpha a}{\alpha a} + \cos \alpha a = \cos k a$ when

$P \rightarrow \infty$.

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Group-C
(Long Answer Type Questions)

5 x 6=30

7. Explain why FINFET Devices are used in place of conventional MOSFETs. (5)
8. Describe Graphene with a suitable diagram of graphene. (5)
9. Explain different applications of carbon nanotube. (5)
10. Describe Short Channel Effects. (5)
11. Discuss advantage and disadvantage of FinFET structure. (5)
12. Compare different types of hybridization observed in carbon. (5)

OR

Differentiate Armchair carbon nanotube, Zigzag carbon nanotube, Chiral carbon nanotube. (5)
