BRAINWARE UNIVERSITY

Term End Examination 2023
Programme – B.Tech.(ECE)-2019/B.Tech.(ECE)-2020
Course Name – Nano Electronics
Course Code - PEC-ECEL601A
(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) Represent that any wave function can be written as a linear combination of _____

a) Eigen Vectors
b) Eigen Values
c) Eigen Functions
d) Operators

(ii) Recall that the polarity of the inversion layer in a MOSFET is the same as

a) Charge on gate electrode
b) Minority carriers in the drain
c) Majority carriers in substrate
d) Majority carrier. in source

(iii) Identify that the extremely high input impedance of a MOSFET is primarily due to the

a) Absence of its channel
b) Negative Gate-source voltage
c) Depletion of current carriers
d) Extremely small leakage current of its gate capacitor

(iv) Indicate how many gates are present in double gate MOSFET?

a) 1
b) 2
c) 3
d) 4

(v) Choose Gate engineering technique is used to

a) decrease DIBL
b) minimize hot carrier effect
c) minimize threshold voltage roll off
d) all of these

(vi) Recall the fullform of CNTs as

a) Carbon Nanotubes
b) Carbon Nanotechnology
c) Carbon Nanoscience and technology
d) Carbon Nine Technology

(vii) Select which nanomaterial is used for cutting tools?

a) Fullerene
b) Aerogel
c) Tungsten Carbide
d) Gold

(viii) Represent the Bonding between the layers of Graphite is _____

a) Strong
b) Weak
c) Very tightly bonded
d) Not bonded

(ix) Restate that the fullerenes are composed with _____

a) Graphene sheets b) Graphite
c) Lead d) Other carbon materials

(x) Select the dimension of the Nanomaterial which is less than

a) 1nm b) 10nm
c) 100 nm d) 1000nm

(xi) Locate that for a particle inside a box, the potential is maximum at x = _____

a) L b) 2L
c) L/2 d) 3L

(xii) Tell the colour of the nano gold particles

a) Yellow b) orange
c) red d) variable

(xiii) State the wave function of a moving particle for all values of x,y,z must be

a) finite b) infinite
c) zero d) none of these

(xiv) Identify who has first talked about nano-technology

a) Albert Einstein b) Newton
c) Gordon E. Moore d) Richard Feynman

(xv) Identify which of the following can be a wave function?

a) tan x b) sin x
c) cot x d) sec x

Group-B

(Short Answer Type Questions) 3 x 5=15

2. State basic postulates of quantum mechanics. (3)
3. Discuss a short note on Brillouin zone. (3)
4. Enumerate the advantage of CMOS scaling. (3)
5. Describe single electron transistor? (3)
6. Illustrate the physical interpretation of the wave function (3)

OR

Estimate that, the two solutions of the Schrodinger equation are linearly independent. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Evaluate the 3-dimensional Schrodinger equation for time independent case. (5)
8. Describe some examples of nano electronic devices and their applications? (5)
9. Evaluate the expression of wave function of a free particle in a one-dimensional potential box. (5)
10. Describe short channel effect? (5)
11. Describe 2D semiconductor? (5)
12. Distinguish the physical properties of diamond and graphite. (5)

OR

Explain how it can be folded to form the Zigzag carbon nanotube. (5)

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