

Online Examinations (Even Sem/Part-I/Part-II Examinations 2020 - 2021)

Course Name - --Nano Electronics

Course Code - PEC-ECEL601A

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Answer all the questions. Each question carry one mark.

9. 1. Which concept marks a fundamental difference between the dynamics of the electromagnetic field (Maxwell equations) and the Schrödinger equation?

Mark only one oval.

- Wave nature
- Momentum
- Potential
- Mass

10. 2. The Schrödinger equation has a counterpart in classical mechanics, namely the equation of

Mark only one oval.

- mass conservation
- momentum conservation
- energy conservation
- number of particles conservation

11. 3. Nanomaterial are the materials with at least one dimension measuring less than _____

Mark only one oval.

- 1nm
- 10 nm
- 100 nm
- 200 nm

12. 4. The colour of the nano gold particles is _____

Mark only one oval.

- Yellow
- orange
- red
- variable

13. 5. The first talk about nano-technology was given by _____

Mark only one oval.

- Albert Einstein
- Newton
- Gordon E. Moore
- Richard Feynman

14. 6. The initial tools used to help launch the nanoscience revolution were _____

Mark only one oval.

- Binoculars
- Microscope
- Scanning probe instruments
- Interferometer

15. 7. In a semiconductor which of the following carries can contribute to the current?

Mark only one oval.

- electrons
- holes
- both electrons and holes
- none of these

16. 8. MOS transistor

Mark only one oval.

- Has only one p-n junction
- Has only two electrodes
- Gate electrode is in direct contact with silicon
- Conducts when sufficient voltage is applied to gate electrode

17. 9. The polarity of the inversion layer in a MOSFET is the same as

Mark only one oval.

- Charge on gate electrode
- Minority carriers in the drain
- Majority carriers in substrate
- Majority carrier. in source

18. 10. The threshold voltage of a n-channel enhancement only MOSFET is 0.5V, when the device is biased at a gate voltage of 3V, pinch-off would occur at a drain voltage of

Mark only one oval.

- 1.5 V
- 2.5 V
- 3.5 V
- 4 V

19. 11. The extremely high input impedance of a MOSFET is primarily due to the

Mark only one oval.

- Absence of its channel
- Negative Gate-source voltage
- Depletion of current carriers
- Extremely small leakage current of its gate capacitor

20. 12. What is the function of silicon dioxide layer in MOSFETS

Mark only one oval.

- To provide high input resistance
- to increase current carriers
- To provide high output resistance
- Both to provide high input resistance and increase current carriers

21. 13. For a MOS capacitor fabricated on a p-type semiconductor , strong inversion occurs when

Mark only one oval.

- Surface potential is equal to the Fermi potential
- surface potential is zero
- Surface potential is -ve and equal to Fermi potential in magnitude
- Surface potential is +ve and equal to twice the Fermi potential

22. 14. Change of drift velocity due to scaling is known as

Mark only one oval.

- hot carrier effect
- punch through
- velocity saturation
- none of these

23. 15. Surface scattering effect

Mark only one oval.

- reduces effective mobility
- increases effective mobility
- effective mobility remain same as bulk mobility
- none of these

24. 16. The full form of SCE is

Mark only one oval.

- Small Channel effect
- Short Channel effect
- Both of the above
- none of these

25. 17. The short channel effect is resulting from

Mark only one oval.

- small drain depletion region
- change in electron drift characteristics
- depletion charge sharing between the gate , the source and the drain
- none of these

26. 18. Due to short channel effects in deep submicron MOSFETs compared to long channel MOSFET

Mark only one oval.

- V_{th} increases
- V_{th} decreases
- V_{th} remains same
- None of these

27. 19. The phenomenon RSCE arises due to

Mark only one oval.

- strong electric field along the channel
- change in electron mobility in the channel
- charge sharing
- lateral dopant non uniformity in the channel

28. 20. To reduce DIBL effect in a short channel MOSFET

Mark only one oval.

- substrate doping concentration can be increased at the edges of the source and drain junctions
- substrate doping concentration can be decreased at the edges of the source and drain junctions
- substrate doping concentration can be same at the edges of the source and drain junctions
- none of these

29. 21. The problems of hot carriers can be minimized by

Mark only one oval.

- increasing the electric field
- increasing the doping concentration near the drain region
- decreasing the doping concentration near the drain region
- none of these

30. 22. Velocity saturation causes the short channel device to saturate forvalues of V_{DS} .

Mark only one oval.

- larger
- smaller
- moderate
- very large

31. 23. The condition for ballistic transport is

Mark only one oval.

- Hot electrons are generated by impact ionization
- Device operates in breakdown regime
- Drain and source depletion layers touches each other
- Channel length is less than mean free path between collision of charge carriers

32. 24. The condition for punch through is

Mark only one oval.

- Hot electrons are generated by impact ionization
- Device operates in breakdown regime
- Drain and source depletion layers touches each other
- Channel length is less than mean free path between collision of charge carriers

33. 25. Indicate which one does not minimize punch-through

Mark only one oval.

- long channel
- weaker substrate doping
- thinner oxide
- shallower junction

34. 26. short channel effect can be characterized by

Mark only one oval.

- saturation drain current depends quadratically upon overdrive voltage
- bulk depletion region becomes assymetrical in shape instead of a rectangular structure
- drain depletion region becomes larger than source depletion region
- threshold voltage decreases with effective channel length

35. 27. OFF state leakage current

Mark only one oval.

- increases with reduction in threshold voltage but speed increases
- affects overall power consumption of the chip severely
- reduces with higher V_{th} transistor, and speed is reduced
- all of these

36. 28. The mobility of carriers in the channel of a MOSFET is lower than in bulk semiconductors because of

Mark only one oval.

- scattering event
- variation of doping concentration
- impact ionization
- oxide wear out

37. 29. Basic function of SiO₂ is (a) Physical strength (b) Isolation (c) Passivation from external contaminants (d) Electrical connection (e) Selective diffusion. The true statements is

Mark only one oval.

- Isolation
- Passivation from external contaminants & Selective diffusion
- Isolation , Passivation from external contaminants & Selective diffusion
- All of these

38. 30. In a MOSFET the threshold voltage can be lowered by

Mark only one oval.

- reducing the substrate concentration
- increasing the substrate concentration
- decreasing the gate oxide thickness
- none of these

39. 31. CNT s are the strongest and stiffest materials in _____

Mark only one oval.

- Tensile strength
- Ductility
- Elasticity
- Energy

40. 32. Standard single walled CNT withstands a pressure up to _____ without deformation.

Mark only one oval.

- 1Gpa
 2Gpa
 20 Gpa
 25 Gpa

41. 33. The nano tube may _____ without friction.

Mark only one oval.

- Slides
 Overlaps
 Under laps
 Collides

42. 34. The optical properties of CNT are due to _____ of photoluminescence

Mark only one oval.

- Absorption
 Emission
 Consumption
 Collision

43. 35. CNT is _____

Mark only one oval.

- Non toxic
- Toxic
- Very Safe
- Not having graphene

44. 36. Most promising applications of the CNT is _____

Mark only one oval.

- Paper batteries
- Solar cells
- Space elevators
- Stab proof

45. 37. CNT can be used for coating and absorption on the surface _____

Mark only one oval.

- Fibre
- Design
- Stains
- Marks

46. 38. Carbon nano tubes are the sheets of graphite about _____

Mark only one oval.

0.1nm

0.2 nm

0.3 nm

0.4 nm

47. 39. Carbon nano tubes are first observed in _____

Mark only one oval.

1992

1991

1990

1993

48. 40. To improve the composite of graphite _____ is used as a catalyst.

Mark only one oval.

CO

NI

CO and NI

TIO

49. 41. Chemical vapour decomposition is developed in an year _____

Mark only one oval.

2001

2002

2006

2007

50. 42. CNTs are capped on both ends with which carbon nanostructure?

Mark only one oval.

Graphite

Diamond

C60

Benzene

51. 43. The metallic tubes have which kind of structure

Mark only one oval.

Armchair

Chiral

Boat

Achiral

52. 44. Carbon nanotubes are poor transmitters of electromagnetic radiations due to their _____

Mark only one oval.

- High conductivity
- Large surface area
- High porosity
- Chemical Stability

53. 45. Nanoscale aluminum oxide increases the _____

Mark only one oval.

- Conductivity
- Resistance
- Ductility
- Stability

54. 46. Quantum dots can be used in _____

Mark only one oval.

- Crystallography
- Optoelectronics
- Mechanics
- Quantum physics

55. 47. The graphite is _____ anisotropic.

Mark only one oval.

- Highly
- Lightly
- Not
- Very less

56. 48. Fullerenes are stable with _____ hybridization

Mark only one oval.

- sp
- sp²
- sp³
- sp⁴

57. 49. The fullerenes that are larger in diameter than nano tubes and having walls of different thickness are _____

Mark only one oval.

- Mega tubes
- Carbon nano tubes
- Bucky ball clusters
- Polymers

58. 50. The wave function of the particle lies in which region

Mark only one oval.

$x > 0$

$x < 0$

$0 < X < L$

$x > L$

59. 51. For a particle inside a box, the potential is maximum at $x =$ _____

Mark only one oval.

L

2L

L/2

3L

60. 52. The wave function of a moving particle for all values of x, y, z must be

Mark only one oval.

finite

infinite

zero

none of these

61. 53. The wave function must be continuous in all regions except in those regions where the potential energy is

Mark only one oval.

- 0
- finite
- infinite
- none of these

62. 54. Which of the following is not a characteristic of wave function?

Mark only one oval.

- Continuous
- Single valued
- Differentiable
- Physically Significant

63. 55. The width of a carbon nanotube is ____ nm.

Mark only one oval.

- 1
- 1.3
- 2.5
- 10

64. 56. $10 \text{ nm} = \underline{\hspace{1cm}} \text{ m}$

Mark only one oval.

- 10^{-8}
- 10^{-7}
- 10^{-9}
- 10^{-10}

65. 57. Fullerene or bucky ball is made up of carbon atoms.

Mark only one oval.

- 100
- 20
- 60
- 75

66. 58. Nanoscience can be studied with the help of...

Mark only one oval.

- quantum mechanics
- Newtonian mechanics
- macro-dynamics
- geophysics

67. 59. In a MOSFET, the polarity of the inversion layer is the same as that of the

Mark only one oval.

- Charge on the Gate electrode
- Minority carries in the drain
- Majority carriers in the substrate
- Majority carries in the source

68. 60. The variation of the threshold voltage with the applied bulk-to-source voltage is typically observed by plotting the _____ as a function of the source-to-drain voltage.

Mark only one oval.

- drain current
- square root of the drain current
- square of the drain current
- natural logarithm of the drain current

69. 61. The values of Energy for which Schrodinger's steady state equation can be solved is called as _____

Mark only one oval.

- Eigen Vectors
- Eigen Values
- Eigen Functions
- Operators

70. 62. When a MOSFET is in saturation region, the effective channel length increases

Mark only one oval.

- with decreasing VGS
- with increasing VGS
- with increasing VDS
- with decreasing VDS

71. 63. Gate engineering technique is used to

Mark only one oval.

- decrease DIBL
- minimize hot carrier effect
- minimize threshold voltage roll off
- all of these

72. 64. Nano is derived from

Mark only one oval.

- Nanos
- Nanus
- dwarf
- all of these

73. 65. Density of state of 0-dimensional system is

Mark only one oval.

- proportional to energy
- inversely proportional to energy
- proportional to square root of energy
- none of these

74. 66. When velocity saturation occurs, I_{dsat} is _____ to V_{sat}

Mark only one oval.

- inversely proportional
- directly proportional
- logarithmically proportional
- not related

75. 67. Gallium arsenide has _____ electron mobility.

Mark only one oval.

- high speed
- low speed
- larger
- smaller

76. 68. Transconductance gives the relationship of

Mark only one oval.

- I_{ds} and V_{ds}
- V_{ds} and V_{gs}
- I_{ds} and V_{gs}
- I_{ds} and d

77. 69. The normalized condition of the wave function of a particle moving inside of one dimensional infinite well is

Mark only one oval.

- 1
- 0
- infinite
- none of these

78. 70. Quadruple gate MOSFET is same as

Mark only one oval.

- Surrounding gate MOSFET
- Double gate MOSFET
- Junctionless MOSFET
- all of these

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