BRAINWARE UNIVERSITY

Term End Examination 2021 - 22
Programme – Bachelor of Technology in Electronics & Communication Engineering
Course Name – Nano Electronics
Course Code - PEC-ECEL601A
(Semester VI)

Time allotted : 1 Hrs.15 Min.

Full Marks : 60

[The figure in the margin indicates full marks.]

Group-A
(Multiple Choice Type Question)

1 x 60=60

Choose the correct alternative from the following :

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

a) Wave nature

b) Momentum

c) Potential

d) Mass

(2) Nanomaterial are the materials with at least one dimension measuring less than _____

a) 1nm

b) 10 nm

c) 100 nm

d) 200 nm

(3) A material with one dimension in Nano range and the other two dimensions are large is called _____

a) Micro-material

b) Quantum wire

c) Quantum well

d) Quantum dot

(4) The melting point of particles in nano form _____

a) Increases

b) Decreases

c) Remains same

d) Increases then decreases

(5) Which of the processes of materials was not described as Nanotechnology?

a) Separation

b) Creation

c) Processing

d) Consolidation

(6) The initial tools used to help launch the nanoscience revolution were _____

a) Binoculars

b) Microscope

c) Scanning probe instruments

d) Interferometer

(7) In a semiconductor which of the following carries can contribute to the current?

O139

a) electrons

b) holes

c) both electrons and holes

d) none of these

(8) MOS transistor

a) Has only one p-n junction

b) Has only two electrodes

c) Gate electrode is in direct contact with silicon

d) Conducts when sufficient voltage is applied to gate electrode

(9) 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

(10) NMOS are better than PMOS because

a) Better noise immunity

b) faster

c) TTL compatible

d) better drive capability

(11) 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

a) 1.5 V

b) 2.5 V

c) 3.5 V

d) 4 V

(12) What is the function of silicon dioxide layer in MOSFETS

a) To provide high input resistance

b) to increase current carriers

c) To provide high output resistance

d) Both to provide high input resistance and increase current carriers

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

a) Surface potential is equal to the Fermi potential

b) surface potential is zero

c) Surface potential is −ve and equal to Fermi potential in magnitude

d) Surface potential is +ve and equal to twice the Fermi potential

(14) Change of drift velocity due to scaling is known as

a) hot carrier effect

b) punch through

c) velocity saturation

d) none of these

(15) The full form of SCE is

a) Small Channel effect

b) Short Channel effect

c) Both of the above

d) none of these

(16) The short channel effect is resulting from

a) small drain depletion region

b) change in electron drift characteristics

c) depletion charge sharing between the gate , the source and the drain

d) none of these

(17) Due to short channel effects in deep submicron MOSFETs compared to long channel MOSFET

a) Vth increases

b) Vth decreases

c) Vth remains same

d) None of these

(18) To reduce DIBL effect in a short channel MOSFET

a) substrate doping concentration can be increased at the edges of the source and drain junctions

b) substrate doping concentration can be decreased at the edges of the source and drain junctions

c) substrate doping concentration can be same at

d) none of these

the edges of the source and drain junctions

(19) The problems of hot carriers can be minimized by

a) increasing the electric field

b) increasing the doping concentration near the drain region

c) decreasing the doping concentration near the drain region

d) none of these

(20) Velocity saturation causes the short channel device to saturate for ....values of VDS.

a) larger

b) smaller

c) moderate

d) very large

(21) The condition for punch through is

a) Hot electrons are generated by impact ionization

b) Device operates in breakdown regime

c) Drain and source deletion layers touches each other

d) Channel length is less than mean free path between collision of change carriers

(22) Indicate which one does not minimize punch-through

a) long channel

b) weaker substrate doping

c) thinner oxide

d) shallower junction

(23) short channel effect can be characterized by

a) saturation drain current depends quadratically upon overdrive voltage

b) bulk depletion region becomes assymetrical in shape instead of a rectangular structure

c) drain depletion region becomes larger than source depletion region

d) threshold voltage decreases with effective channel length

(24) OFF state leakage current

a) increases with reduction in threshold voltage but speed increases

b) affects overall power consumption of the chip severely

c) reduces with higher Vth transistor, and speed is reduced

d) all of these

(25) The mobility of carriers in the channel of a MOSFET is lower than in bulk semiconductors because of

a) scattering event

b) variation of doping concentration

c) impact ionization

d) oxide wear out

(26) Basic function of SiO_2 is (a) Physical strength (b) Isolation (c) Passivation from external contaminants (d) Electrical connection (e) Selective diffusion. The true statements is

a) b only

b) c and e

c) b, c and e

d) all of these

(27) In a MOSFET the threshold voltage can be lowered by

a) reducing the substrate concentration

b) increasing the substrate concentration

c) decreasing the gate oxide thickness

d) none of these

(28) CNT s are the strongest and stiffest materials in _____

a) Tensile strength

b) Ductility

c) Elasticity

d) Energy

(29) Standard single walled CNT withstands a pressure up to _____ without deformation.

a) 1Gpa

b) 2Gpa

c) 20 Gpa

d) 25 Gpa

(30) The nano tube may _____ without friction.

a) Slides

b) Overlaps

c) Under laps

d) Collides

(31) The optical properties of CNT are due to _____ of photoluminescence

a) Absorption

b) Emission

c) Consumption

d) Collision

(32) CNT is _____

a) Non toxic

b) Toxic

c) Very Safe

d) Not having graphene

(33) Most promising applications of the CNT is _____

a) Paper batteries

b) Solar cells

c) Space elevators

d) Stab proof

(34) CNT can be used for coating and absorption on the surface _____

a) Fibre

b) Design

c) Stains

d) Marks

(35) Carbon nano tubes are the sheets of graphite about _____

a) 0.1nm

b) 0.2 nm

c) 0.3 nm

d) 0.4 nm

(36) Carbon nano tubes are first observed in _____

a) 1992

b) 1991

c) 1990

d) 1993

(37) To improve the composite of graphite _____ is used as a catalyst.

a) CO

b) NI

c) CO and NI

d) TIO

(38) Chemical vapour decomposition is developed in an year _____

a) 2001

b) 2002

c) 2006

d) 2007

(39) CNTs are capped on both ends with which carbon nanostructure?

a) Graphite

b) Diamond

c) C60

d) Benzene

(40) The metallic tubes have which kind of structure

a) Armchair

b) Chiral

c) Boat

d) Achiral

(41) Carbon nanotubes are poor transmitters of electromagnetic radiations due to their

_____

a) High conductivity

b) Large surface area

c) High porosity

d) Chemical Stability

(42) Nanoscale aluminum oxide increases the _____

a) Conductivity

b) Resistance

c) Ductility

d) Stability

(43) Quantum dots can be used in _____

a) Crystallography

b) Optoelectronics

c) Mechanics

d) Quantum physics

(44) The graphite is _____ anisotropic.

a) Highly

b) Lightly

c) Not

d) Very less

(45) Fullerenes are stable with _____ hybridization

a) sp

b) sp2

c) sp3

d) sp4

(46) The fullerenes that are larger in diameter than nano tubes and having walls of different thickness are _____

a) Mega tubes

b) Carbon nano tubes

c) Bucky ball clusters

d) Polymers

(47) For a particle inside a box, the potential is maximum at x = _____

a) L

b) 2L

c) L/2

d) 3L

(48) 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

(49) The wave function must be continuous in all regions except in those regions where the potential energy is

a) 0

b) finite

c) infinite

d) none of these

(50) Which of the following is not a characteristic of wave function?

a) Continuous

b) Single valued

c) Differentiable

d) Physically Significant

(51) The size of a quantum dot is _____ nm.

a) 5

b) 10

c) 50

d) 100

(52) The width of a carbon nanotube is _____ nm.

a) 1

b) 1.3

c) 2.5

d) 10

(53) Fullerene or bucky ball is made up of _____ carbon atoms.

a) 100

b) 20

c) 60

d) 75

(54) Nanoscience can be studied with the help of...

a) quantum mechanics

b) Newtonian mechanics

c) macro-dynamics

d) geophysics

(55) In a MOSFET, the polarity of the inversion layer is the same as that of the

a) Charge on the Gate electrode

b) Minority carries in the drain

c) Majority carriers in the substrate

d) Majority carries in the source

(56) 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.

a) drain current

b) square root of the drain current

c) square of the drain current

d) natural logarithm of the drain current

(57) The values of Energy for which Schrodinger's steady state equation can be solved is called as _____

a) Eigen Vectors

b) Eigen Values

c) Eigen Functions

d) Operators

(58) How many gates are present in double gate MOSFET?

a) 1

b) 2

c) 3

d) 4

(59) When a MOSFET is in saturation region, the effective channel length increases

a) with decreasing VGS

b) with increasing VGS

c) with increasing VDS

d) with decreasing VDS

(60) Gate engineering technique is used to

a) decrease DIBL

b) minimize hot carrier effect

c) minimize threshold voltage roll off

d) all of these