

(6 pages)

Reg. No. :

Code No. : 6309

Sub. Code : PNNM 41

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Fourth Semester

Nanoscience and Nanotechnology – Core

MAGNETIC NANOMATERIAL AND DEVICES

(For those who joined in July 2018 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Magnetic permeability has Units as
 - (a) Tesla
 - (b) Henry
 - (c) Tesla / m
 - (d) Henry / m
2. Example for magnetic material used in data storage devices.
 - (a) 45 Permalloy
 - (b) CrO₂
 - (c) Cunife
 - (d) Alnico

3. The dipole magnetic moment (μ) is directly proportional to nuclear spin (I), connected by a constant called the
- (a) Gyromagnetic ratio (γ)
 - (b) Planck's constant (h)
 - (c) Nuclear susceptibility (χ)
 - (d) Chemical shift (δ)
4. The famous experiment demonstrating how spin^{-½} particles can be physically separated into two groups by a magnetic field was performed in 1922 by
- (a) Einstein
 - (b) Heisenberg
 - (c) Stern and Gerlach
 - (d) Planck and Dirac
5. Which of the following materials is paramagnetic?
- (a) Water
 - (b) Fat
 - (c) Bone
 - (d) Air
6. The bulk magnetic properties of matter derive primarily from
- (a) Protons
 - (b) Neutrons
 - (c) Electrons
 - (d) Whole nuclei

7. The component in an optical instrument used to increase the angular object field and to minimize aberrations is called as _____.
- (a) Objective lens (b) Eye lens
(c) Field Lens (d) Plano-concave lens
8. Magnetic susceptibility ferromagnetic materials is
- (a) $+10^{-5}$ (b) -10^{-5}
(c) 10^5 (d) 10^{-5} to 10^{-2}
9. Nonlinear effects which are defined by the intensity – dependent refractive index of the fiber are called as _____.
- (a) Scattering effects
(b) Kerr effects
(c) Raman effects
(d) Tomlinson effects
10. For time varying currents, the field or waves will be
- (a) Electrostatic
(b) Magneto static
(c) Electromagnetic
(d) Electrical

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) What is curie temperature in magnetism?

Or

- (b) Distinguish between soft and hard magnetic material.

12. (a) Write short notes on Retentivity and Coercivity.

Or

- (b) What is the effect of magnetic field on Ferromagnetic materials? Give its properties.

13. (a) Explain: Meissner effect.

Or

- (b) Describe: Kerr effect.

14. (a) What are the applications of Ferrites?

Or

- (b) Explain the energies involved in origin of domains in ferromagnetic materials.

15. (a) Distinguish between ferromagnetic and antiferromagnetic materials.

Or

- (b) Define: Hysteresis. What is meant by Hysteresis loss?

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Briefly explain the Classification of Magnetic Materials.

Or

- (b) Details about the Stoner – Wohlfarth model.

17. (a) Elaborate the notes on Curie – Weiss Law.

Or

- (b) Explain the working principle of electron tunneling spectroscopy.

18. (a) Explain: Zeeman Effect.

Or

- (b) Write short notes on ferromagnetic and antiferromagnetic interfaces.

19. (a) Describe: Fermi – liquid effects.

Or

(b) Explain the classical approach on Lorentz Microscopy.

20. (a) Briefly explain the basic principle and working model of electron holography.

Or

(b) What is Magnetoresistance? Explain: Giant Magnetoresistance.

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Reg. No. :

Code No.: 6590

Sub. Code: ZNNM 11

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022

First Semester

Nano Science and Nano Technology – Core

MATHEMATICAL PHYSICS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The inverse Laplace transform of $1/(S + 1)$ is

- (a) e^{-2t} (b) et
(c) e^{-t} (d) e^{2t}

2. Poisson's equation is

- (a) $\text{div } E = \frac{S}{\epsilon_0}$ (b) $\text{curl } E = J$
(c) $\nabla^2 \phi = 0$ (d) $\nabla^2 \phi = -\rho / \epsilon_0$

3. $\nabla_x[(e.r)e]=$ ————— when, $e =$ unit vector
 (a) 0 (b) 1
 (c) -1 (d) None
4. The Laplace transform of t^3e^{at} is —————.
 (a) $\frac{1}{(s-a)^4}$ (b) $\frac{2}{(s-a)^4}$
 (c) $\frac{6}{(s-a)^4}$ (d) $\frac{a}{(s-a)^4}$
5. The Cauchy – Riemann equation is
 (a) $f(z)=f(x+iy)$ (b) $f(z)=x/y$
 (c) $f(z)=xy$ (d) $f(z)=e^{ixy}$
6. The value of $\oint_C \frac{1}{z^2+4} dz$ where $C |Z-2i|=1$ is
 (a) 0 (b) 1/5
 (c) $\pi/2$ (d) $\pi/3$
7. If $P_n(x)$ is the legendre polynomial of order n then $3x^2+3x+1$ can be expressed as —————.
 (a) $2P_2+3P_1$ (b) $4P_2+2P_1+P_0$
 (c) $3P_2+3P_1+P_0$ (d) $2P_2+3P_1+2P_0$

8. Value of $P_n(1)$ is equal to
(a) 0 (b) (-1)
(c) $P_n(-1)$ (d) 1
9. Give the cylindrical coordinates of the point 'p' whose Cartesian coordinates are $x = 1, y = \sqrt{3}$ and $z = 4$ units.
(a) $r = 1, \varphi = 30^\circ, z = 4$ (b) $r = 2, \varphi = 45^\circ, z = 4$
(c) $r = 2, \varphi = 60^\circ, z = 4$ (d) none
10. D' Alembert's solution of 1-D vibrating string is _____.
(a) $f(x - ct)$
(b) $f(x + ct)$
(c) $f_1(x - ct) + f_2(x + ct)$
(d) $f_1(x - ct) * f_2(x + ct)$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Prove that $\vec{A} \cdot \vec{A} = A^2$ and $\vec{A} \times \vec{A} = 0$.

Or

- (b) Find $\nabla(u + v)$ at the point $(1, 0, -2)$.

12. (a) Prove $L(\sin hat) = \frac{a}{s^2 - a^2}$.

Or

(b) State convolution theorem for inverse Laplace transform.

13. (a) Determine where $f(z) = \frac{z+1}{z-1}$, $z \neq 1$ satisfies auchy Reimann condition.

Or

(b) Evaluate the following integral using Cauchy-Integral formula $\int_c \frac{4-3z}{z(z-1)(z-2)} dz$, where C is the circle $|z| = 3/2$.

14. (a) Prove Bessel function $J_{n+1}(x) = 2n/x J_n(x) - J_{n-1}(x)$.

Or

(b) Show that $P_n(-x) = (-1)^n P_n(x)$. Hence prove that $P_{m+1}(-x) = -P_{2m+1}x$.

15. (a) Obtain the differential equation of a vibrating string?

Or

(b) Find the solution of heat flow equation $\nabla^2 u = \frac{1}{h^2} \frac{du}{dt}$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Find eigen values and eigen vectors of

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}.$$

Or

- (b) Find $\nabla\phi$ if (i) $\phi = 1/n|r|$, (ii) $\phi = \frac{1}{r}$.

17. (a) Solve the equations by Cramer's rule

$$2x - 4y + 6z = 24$$

$$4x - 5y + 8z = 39$$

$$x - 3y - 5z = -41$$

Or

- (b) Find the inverse Laplace transform of the following

(i) $\frac{1}{s^2 - 5s - 6}$

(ii) $\frac{2}{s^2 - 7s + 12}$

(iii) $\frac{2}{s^2 - 7s + 12}$

18. (a) State and prove Cauchy's integral formula

$$f(z_0) = \frac{1}{s^2 - 5s + 6} \int \frac{f(z) dz}{z - z_0}. \text{ State also the conditions of its applicability.}$$

Or

- (b) State and prove Cauchy's residue theorem.

19. (a) For Bessel's function show that

$$[x_n J_n(x)] = x_n J_{n-1}(x).$$

Or

- (b) Write Legendre differential equation and solve it by series integration method and prove that if $P_n(x)$ is a solution of equation then $(2_{n+1}x P_n = (n+1)P_{n+1} + nP_{n-1})$.

20. (a) Solution of Laplace's equation in spherical polar coordinate (r, θ, φ) .

Or

- (b) Derive heat conduction equation and solve it in two dimensional Cartesian coordinates.

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Reg. No. :

Code No. : 6591

Sub. Code : ZNNM 12

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

First Semester

Nanoscience and Technology — Core

QUANTUM MECHANICS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The de Broglie wavelength of matter wave is

(a) hp

(b) hmv

(c) $\frac{h}{p}$

(d) $\frac{h}{4p}$

2. The average lifetime of an atom in excited state is
- (a) 1×10^{-3} sec (b) 1×10^5 sec
(c) 1×10^{-8} sec (d) 1×10^3 sec
3. For the bound state of a particle in a square well the energy is
- (a) $E = 0$ (b) $E = \alpha$
(c) $E < 0$ (d) $E > 0$
4. Any wave function having symmetry property is said to be of _____ parity
- (a) Zero (b) Even
(c) Odd (d) Infinite
5. If there exists only one eigen function corresponding to a given eigen value then they are _____
- (a) Nondegenerate (b) degenerate
(c) discrete (d) Continuous
6. The eigenvalue problem is related to the _____ system of linear equations
- (a) numerical (b) homogeneous
(c) nonlinear (d) none

7. Stark effect is the splitting of a spectral line in the presence of
- (a) Electric field (b) Magnetic field
(c) Inert environment (d) Vacuum
8. The variation method is a way of finding approximations to _____ energy eigen state.
- (a) Lowest (b) Highest
(c) Zero (d) None
9. When the torque acting on a rotating body is zero then what will remain constant?
- (a) force
(b) linear momentum
(c) angular momentum
(d) all the above
10. Particles with an integer spin are called
- (a) fermions (b) bosons
(c) electrons (d) protons

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Derive an expression for de-Broglie wavelength.

Or

- (b) Write the properties of the wave function.

12. (a) What are the postulates of quantum mechanics?

Or

- (b) State and explain kronig penning model.

13. (a) What are the properties of a self-adjoint operator?

Or

- (b) Write a note on the Dirac delta function.

14. (a) Explain the stark effect in detail.

Or

- (b) Explain the first order perturbation theory.

$$A_{n(1)} = -\frac{\langle n | H_1 | m \rangle}{(E_m - E_n)}$$

15. (a) Define spin angular momentum.

Or

(b) Write a note on the normalization of the Eigen function.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions choosing either (a) or (b).

16. (a) Obtain one-dimensional Schrodinger equations for a free particle.

Or

(b) Derive an expression for time independent Schrodinger equation.

17. (a) Discuss the quantum mechanical barrier penetration through a 1-D square well potential barriers.

Or

(b) State and prove Ehrenfest's theorem.

18. (a) Write a note on completeness and normalization of an eigen function.

Or

(b) Derive the expression for angular momentum in the spherical-coordinate system.

19. (a) Explain Zeeman effects. What are its types-explain?

Or

- (b) Explain second order perturbation theory in detail.

20. (a) Explain the effect of an electric field on the energy level of atom by stark effect.

Or

- (b) Obtain the Clebsch Gordan coefficient for the partied $j_1 = 1/2$ and $j_2 = 1/2$.
-

3. Which of the following is a characteristic property of nickel compounds?
- (a) They form hard, brittle crystals
 - (b) They have low melting points
 - (c) They have low boiling points
 - (d) They contain no charged particles
4. Elastic waves in crystals are made up of
- (a) Photons
 - (b) Nanoparticles
 - (c) Atoms
 - (d) Phonons
5. If σ is the conductivity. What is the relation between the electric field E and the current density J in a conducting medium?
- (a) $\sigma = J / E$
 - (b) $\sigma = 1 / JE$
 - (c) $\sigma = E / J$
 - (d) $\sigma = EJ$
6. Hall effects can be used to measure
- (a) Electric field intensity
 - (b) Magnetic field intensity
 - (c) Carrier concentration
 - (d) None of these

7. A p-type semiconductor is
- (a) positively charged
 - (b) negatively charged
 - (c) electrically neutral
 - (d) none
8. In a thermopile, number of thermocouples are connected in
- (a) series
 - (b) parallel
 - (c) either series parallel
 - (d) none
9. Material exhibiting zero values of resistivity are known as
- (a) conductors
 - (b) semi-conductors
 - (c) Insulators
 - (d) super conductors
10. In _____ effects current persists for a longer time
- (a) DC Josephson
 - (b) AC Josephson
 - (c) Both (a) and (b)
 - (d) None

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What are miller indices. Explain with an example. Explain quasicrystals?

Or

- (b) Explain Brillouin Zones.

12. (a) What are ionic crystals – Explain?

Or

- (b) Define the vibration of crystals with a monoatomic basic.

13. (a) Derive an expression for the energy level of a free electron gas in 3-D.

Or

- (b) Obtain an expression for electrical conductivity and hence arrive ohm's law.

14. (a) Explain thermo-electric effects.

Or

- (b) What do you mean by optical reflectance? Explain the phenomenon in detail.

15. (a) What are Type II superconductor? Explain its characteristics.

Or

- (b) What are the properties of superconductors?

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Explain in detail about BCC structure and derive its parameters.

Or

- (b) What are covalent crystals. Explain covalent crystals in detail.

17. (a) What is scattering? Explain Inelastic scattering by phonons.

Or

- (b) Explain the Quantization of elastic waves.

18. (a) Derive an expression for the density of state in a free electron gas in 3-D.

Or

- (b) Explain the Hall effect in detail.

19. (a) Explain n-type and p-type semiconductors with examples.

Or

- (b) Explain Intrinsic carrier concentration and derive expression for it.

20. (a) What is the Josephson effect? Explain AC Josephson effect.

Or

- (b) What is BCS theory? Explain its features.
-

(6 pages)

Reg. No. :

Code No. : 6593

Sub. Code : ZNNM 14

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

First Semester

Nano Science and Nanotechnology

ELECTRONICS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The branch of algebra in which the values of the variables are the truth values true and false usually denoted by _____ and _____ respectively.
 - (a) 1,0
 - (b) 1,2
 - (c) 2,3
 - (d) 3,4

2. Boolean algebra is used as a tool for the analysis and design of _____ circuits.
- (a) Basic (b) Logic
(c) Digital (d) Numeral
3. Elaborate SOP _____.
- (a) Symbol of product (b) Sum of product
(c) State of product (d) None of the above
4. Full form of POS is
- (a) Product of sum (b) Possibility of sum
(c) All the above (d) None of the above
5. In a _____ loop the output attempts to do whatever is necessary to make the voltage difference the inputs zero.
- (a) Open (b) Infinte
(c) Positive (d) Closed
6. Real Op amps _____ from the ideal model in various aspects.
- (a) Same (b) Differ
(c) May be same (d) All the above

7. The comparators negative input is connected to voltage dividers upper reference voltage and the comparators positive inputs is connected to _____.
- (a) Threshold (b) Infinity
(c) Trigger (d) Comparator
8. The comparator positive input is connected to voltage divider lower reference and the comparators negative input is connected to _____.
- (a) Comparator (b) Flip-flop
(c) Trigger (d) Thershold
9. Device which perform an output function are generally called _____.
- (a) Sensors (b) Transducers
(c) Signals (d) Actuators
10. All types of sensors can be closed as two kinds either passive sensor or _____.
- (a) Actuator
(b) Transducers
(c) Active
(d) All the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Discuss the logic gates with symbols truth-tables circuit diagram and working of AND and OR gates.

Or

- (b) Explain the logic gates with symbols truth-tables circuit diagram and working of EX-OR and EX-NOR gates.

12. (a) Construct the implementation of SOP using NAND and NOR gates.

Or

- (b) Express the implementation of POS using NAND and NOR gates.

13. (a) Explain instrumentation amplifier with a schematic diagram.

Or

- (b) Discuss an operational amplifier and OP amp differentiator.

14. (a) Describe the schematic diagram of monostable operation and explain its functions and applications.

Or

- (b) Illustrate the schematic diagram of astable operation and explain its functions and applications?

15. (a) Express Op-amp based feedback amp with a neat schematic diagram.

Or

- (b) Compare transducer and sensors with example.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

16. (a) Prove De-morgans theorem.

Or

- (b) State and prove Boolean algebras theorem.

17. (a) Discriminate SOP and POS in digital logic.

Or

- (b) (i) Justify K-map with significant example.
(ii) Discuss the variable in K-map.

18. (a) Construct the diagram of IC OP amp 741 and explain the functionality of each pins.

Or

- (b) Summarize the applications of OP amp.

19. (a) Illustrate the pin diagram, working of IC555 timer with neat diagram.

Or

- (b) Estimate the functions of VCO with schematic diagram and applications.

20. (a) Give a brief note on impedance matching with a schematic diagram.

Or

- (b) Elaborate in detail what is signal conditioning and recovery.

(6 pages)

Reg. No. :

Code No. : 6598

Sub. Code : ZNNM 31

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Third Semester

Nanoscience and Nanotechnology - Core

CHARACTERIZATION OF NANOMATERIALS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The detector in x-ray diffraction that detects the visible radiation is
 - (a) proportional counter
 - (b) silicon counter
 - (c) Galay detector
 - (d) slintillation counter
2. X-rays are generated by
 - (a) Geiger tube
 - (b) Goniometer
 - (c) Coolidge tube
 - (d) Rotumeter

3. The resistance differed by a material to deformation when it is subjected to external load if _____
- (a) resistivity (b) resilience
(c) stress (d) strain
4. The compressive residual stress _____ the fatigue limit
- (a) Increases (b) decreases
(c) does not change (d) no relation
5. Electron microscope can give a magnification upto _____
- (a) 400,000 X (b) 100,000 X
(c) 15000 X (d) 100 X
6. The secondary electrons radiated back in scanning microscope is collected by?
- (a) specimen (b) anode
(c) vacuum chamber (d) cathode
7. The colour of the nanogold particle is _____
- (a) yellow (b) orange
(c) red (d) variable

8. The first talk about nano-technology was given by
(a) Albert Einstein (b) Neutron
(c) Gordon E. Moore (d) Richard Feynman
9. Select the wavelength range corresponding to UV-visible region.
(a) 400 - 800 nm (b) 200 - 800 nm
(c) 0.25 μm – 2.5 μm (d) 2.5 μm -1 mm
10. The possible transitions for water molecule in UV-visible region are
(a) $\sigma - \sigma^*$ (b) $n \rightarrow \pi^*$, $\pi \rightarrow \pi^*$
(c) $\sigma - \sigma^*$, $n \rightarrow \pi^*$ (d) $n \rightarrow \sigma^*$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain the dislocation density micro strain.

Or

- (b) Explain in detail about neutron diffraction.

12. (a) Explain the micro hardness technique.

Or

- (b) Discuss about the nano indentation.

13. (a) Explain the scanning probe microscopy.

Or

(b) Describe the construction and working of transmission electron microscope.

14. (a) Explain the properties of light and nanotechnology.

Or

(b) Explain the photonic crystals.

15. (a) Explain the applications of photoluminescence spectrometer.

Or

(b) Explain the antimicrobial studies.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Explain the comparison of X-ray and neutron powder pattern.

Or

(b) Describe the macromolecular crystallography using synchrotron radiation.

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[P.T.O.]

17. (a) Explain the glass transition and relaxation behaviour.

Or

- (b) Discuss the abrasion and wear resistance superplasticity.

18. (a) Explain the construction and working of scanning electron microscope.

Or

- (b) Describe the construction and working of STM.

19. (a) Explain the absorbance, surface plasma excitation and size dependent PL.

Or

- (b) Discuss the waveguide and control of light paths.

20. (a) Explain the working and applications of FTIR spectrometer.

Or

(b) Describe the working of UV-Vis-NIR spectrometer.

(6 pages)

Reg. No. :

Code No. : 6599

Sub. Code : ZNNM32

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Third Semester

Nanoscience and Nanotechnology

NANOELECTRONICS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Nanomaterials are the materials with at least one dimension measuring less than _____
 - (a) 1 nm
 - (b) 10 nm
 - (c) 100 nm
 - (d) 1000 nm

2. The melting point of particles in nanoform

- (a) Increases (b) Decreases
(c) Remains same (d) None of the above
3. Time taken for a diode to reach 90% at its final value when switched from steady state is

- (a) 2.3* time constant
(b) 2.2* time constant
(c) 1.5* time constant
(d) equals the time constant
4. The time constant of a series RL circuit (τ) is given by
- (a) $\frac{R}{L}$ (b) $\frac{L}{R}$
(c) RC (d) $\frac{1}{RL}$
5. Quantum dots are _____ in nature.
- (a) inorganic (b) organic
(c) biologic (d) metallic

6. The polymeric nanoparticles come under _____ dimensional nanomaterials?
- (a) zero (b) one
(c) two (d) three
7. Subtraction in computers is carried out by
- (a) 1's complement (b) 2's complement
(c) 3's complement (d) 4's complement
8. Which of the architecture is power efficient?
- (a) RISC (b) ISA
(c) IANA (d) CISC
9. What are sunglasses made of?
- (a) Colored glasses (b) Tin glass
(c) Silica (d) Polaroids
10. Spinpolarized light can be produced by
- (a) Nicol prison (b) NaCl crystal
(c) Biprisan (d) None of these

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the introduction of nanoelectronics.

Or

- (b) Discuss about the future application of nanoelectronics.

12. (a) Discuss about the basic concept of molecular electronic components.

Or

- (b) Explain the characterization of switches.

13. (a) Describe the existence of quantum dots.

Or

- (b) Explain the concept at quantum wires.

14. (a) Describe the working of single electron circuits.

Or

- (b) Explain the molecular circuits.

15. (a) Explain the process of spinpolarization.

Or

(b) Explain the working of spindiodes.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Explain the overview of basic nanoelectronics.

Or

(b) Explain the tools for micro and nanofabrication.

17. (a) Explain the complex molecular devices.

Or

(b) Explain the polyphenylene based molecular rectifying diode switches.

18. (a) Explain the quantum mechanical tunnel diodes.

Or

(b) Explain the nanoelectronics and nanotechnology.

19. (a) Explain the quantum dot cellular automata.

Or

(b) Explain the nanocomputer architecture.

20. (a) Explain the spintronics devices and applications.

Or

(b) Explain the working of spin transistors.

(6 pages)

Reg. No. :

Code No. : 6600

Sub. Code : ZNNM 33

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Third Semester

Nano Science and Nano Technology – Core

BASIC OF NANOBIO TECHNOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The art and science of etching writing or printing the microscopic level in the order of nanometer is
 - (a) NEMs
 - (b) Nanolithography
 - (c) Nanofabrication
 - (d) Nanopalteinins

2. Which of the following nanomaterials contains a hydrophilic peptide head group and one or more hydrophobic alkyl tails?
 - (a) Lipoproteins
 - (b) Peptide amphiphiles
 - (c) Micelles
 - (d) Carbon nanotubes

3. Which of the following method employs changes in polarized light to determine film thickness?
 - (a) Surface tensiometry
 - (b) Particle size analyzer
 - (c) Ellipsometry
 - (d) AFM

4. Which is an example of top down approach for the approach of nanomaterials?
 - (a) Gas phase agglomeration
 - (b) Molecular self assembly
 - (c) Mechanical grinding
 - (d) Molecular beam epitaxy

5. The bioremediation process involving the usage of plants to degrade pollutants is
 - (a) Compositing
 - (b) Biopile
 - (c) Phytoremediation
 - (d) Land Farming

6. Which of the following is the physico-chemical component?
- (a) Enzymes (b) Antibodies
(c) Transducers (d) Cells or tissues
7. This particulate system is also known as “bodies of water”
- (a) Aquasome (b) Liposome
(c) Niosome (d) Dendrime
8. A lipid bilayer structure that encloses an internal aqueous volume
- (a) Niosome
(b) Liposome
(c) Solid lipid nanoparticle
(d) Nanoparticle
9. Which of the following are applications of quantum dots?
- (a) Immunolabeling and fluorescence imaging
(b) Drug delivery
(c) An tag for other drug carries
(d) All the above

10. Structures that have thickness or diameter constrained to less than 100 nm or less and an unconstrained length are called as
- (a) Nanotubes (b) Nanowires
(c) Nanocrystals (d) Buckyballs

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Outline applications of Nanobiotechnology.

Or

- (b) Discuss briefly nanopore technology.

12. (a) Write the characteristics of Self Assembled Monolayer (SAM).

Or

- (b) Discuss briefly Electron beam Lithography.

13. (a) Write a note on Nanoclusters.

Or

- (b) Outline the application of Biosensor.

14. (a) Describe immuno modulators drugs.

Or

(b) Discuss how can we design nanocarrier for oral drug delivery.

15. (a) Describe Quantum dots for live cells.

Or

(b) Explain what happens during sentinel lymph node mapping.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Explain production of inorganic nanoparticles and its applications.

Or

(b) Define terms :

(i) Nanoparticles

(ii) Nanospheres

(iii) Nano capsules.

17. (a) Discuss briefly organic nanomaterials with examples.

Or

(b) Explain the types of self assembled nanostructure.

18. (a) Explain DNA aptamers.

Or

(b) Explain the fabrication of Biosensor.

19. (a) Explain vaccines in drug carrier Nanotherapeutics.

Or

(b) Define Nanopesticides and Nanofertilizers.

20. (a) Explain a biomagnetic systems for in VIVO cancer imaging.

Or

(b) Explain Invivo imaging system.

(6 pages)

Reg. No. :

Code No. : 6601

Sub. Code : ZNNM 34

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Third Semester

Nano Science and Nano Technology – Core

RESEARCH METHODOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Who was the author of the book named “Methods in social research”?
(a) Kerlinger (b) CR Kothari
(c) Goode and Hatt (d) Wilkinson

2. In order to pursue the research, which of the following is priorly required?
 - (a) Developing a research design
 - (b) Formulating a research question
 - (c) Deciding about the data analysis procedure
 - (d) Formulating a research hypothesis

3. Which is related to some abstract ideas or theory?
 - (a) Contextual research
 - (b) Conceptual research
 - (c) Ideal research
 - (d) Emprical research

4. The research is concerned with qualitative phenomena
 - (a) Qualitative (b) Descriptive
 - (c) Quantitative (d) Numerical

5. The name of the conceptual framework in which the research is carried out
 - (a) Research design (b) Research paradigm
 - (c) Synopsis of research (d) Research hypothesis

6. The format of thesis writing is the same as in
 - (a) Writing of seminar representation
 - (b) Preparation of research paper/article
 - (c) A research dissertation
 - (d) Presenting a workshop / conference paper

7. What is presented in the findings section of a research report?
 - (a) A discussion of the results
 - (b) The quantitative or qualitative data that was collected
 - (c) The theoretical foundations for the research study
 - (d) The methods that we are used to collect the data

8. The conclusion of a research report
 - (a) Can introduce new information
 - (b) Must be based only on material presented in the report
 - (c) Same as the abstract except that it is presented at the end of the report
 - (d) Should focus only on the findings of the research

9. The act of presenting some one else's work or idea own considered as
- (a) Plagiarism
 - (b) Academic dishonesty
 - (c) Wrongful appropriation
 - (d) All of these
10. Which of the following software is paid software for checking the similarity index in a research paper
- (a) Viper
 - (b) Plag truck
 - (c) Urkund
 - (d) Copy leaks

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Outline the objectives of research.
- Or
- (b) Write criteria of good research.
12. (a) Explain conceptualization in research survey of literature.
- Or
- (b) Explain the significance of primary data.

13. (a) Write the features of a good research design.

Or

(b) Discuss the concepts relating to research design.

14. (a) Explain data collection tool and data analysis in reporting research.

Or

(b) Write short notes on foot notes and bibliography.

15. (a) Write the fundamental ethical principles in research.

Or

(b) Write note on plagiarism in research journals.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) List out the steps involved in research process.

Or

(b) Explain Quantitative Vs Qualitative research.

17. (a) Explain the steps in formulating the research problem.

Or

(b) Describe the important steps in writing an effective literature review.

18. (a) What is research design? Explain the concept of research design and what are the types of research design.

Or

(b) Explain the importance of research design.

19. (a) Define research report. Explain the essentials of a good research report.

Or

(b) Explain the types of report research.

20. (a) Explain why is ethics important in research and publication.

Or

(b) Explain intellectual property rights and patent law.