

Reg. No. : .....

Code No. : 5651

Sub. Code : ZNNM 24

M.Sc. (CBCS) DEGREE EXAMINATION,  
APRIL 2023.

Second Semester

Nanoscience and Nanotechnology – Core

NUMERICAL METHODS

(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. What is the basic idea behind the Jacobi method?
  - (a) The method involves factoring the matrix into an upper triangular matrix and a lower triangular matrix
  - (b) The method involves solving the system of equations one equation at a time, using the most recent approximations of the unknowns to calculate the next approximations.
  - (c) The method involves solving the system of equations using a series of transformations that reduce the matrix to a diagonal matrix
  - (d) The method involves solving the system of equations by iteratively refining the current approximation of the solution until a desired level of accuracy is achieved

2. Which of the following is an advantage of iterative numerical methods over direct methods?

- (a) Iterative methods always give exact solutions
- (b) Iterative methods are always faster than direct methods
- (c) ✓ Iterative methods can be used for non-linear systems of equations
- (d) Iterative methods can be more memory efficient than direct method

3. What is the basic idea behind least square approximation?

- (a) The method involves transforming the system of equations into an upper triangular matrix using elementary row operations
- (b) The method involves solving the system of equations by finding the intersection of the planes represented by the equations
- (c) ✓ The method involves finding the line that minimizes the sum of the squared distances between the line and the data points
- (d) The method involves finding the solution that minimizes the sum of the squared differences between the predicted values and the actual values

4. Which of the following is an example of a problem that can be solved using least square approximation?

- (a) Finding the roots of a polynomial equation
- (b) Solving a system of non-linear equations
- (c) Fitting a straight line to a set of data points
- (d) Minimizing a non-linear function

5. Which of the following is an example of a function that can be accurately integrated using the trapezoidal rule?

- (a) A smooth, continuous function
- (b) A function with a large number of oscillations
- (c) A function with a discontinuity
- (d) A function with a singularity

6. Which of the following is true regarding the error of the trapezoidal rule?

- (a) The error decreases as the step size decreases
- (b) The error is proportional to the square of the step size
- (c) The error is proportional to the cube of the step size
- (d) The error is independent of the step size

7. Which of the following is true regarding the order of Euler's method?
- (a) Euler's method is a first-order method
  - (b) Euler's method is a second-order method
  - (c) Euler's method is a third-order method
  - (d) Euler's method can be any order, depending on the step size

8. Which of the following is true regarding the order of Runge-Kutta methods?
- (a) Runge-Kutta methods are always first-order methods
  - (b) Runge-Kutta methods can be any order, depending on the number of stages
  - (c) Runge-Kutta methods are limited to second-order accuracy
  - (d) Runge-Kutta methods are always fourth-order methods

9. Which type of second-order partial differential equation has solutions that can have singularities that propagate with finite speed?
- (a) Elliptic equations
  - (b) Parabolic equations
  - (c) Hyperbolic equations
  - (d) None of the above

10. Which of the following is NOT a characteristic of hyperbolic partial differential equations?
- (a) Solutions can have singularities that propagate with finite speed
  - (b) Solutions depend on both the initial and boundary conditions
  - (c) Solutions can have shocks or discontinuities
  - (d) Solutions can have non-unique solutions

PART B — (5 × 5 = 25 marks)

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

11. (a) Find the positive root  $f(x) = 2x^3 - 3x - 6 = 0$  by Newton-Raphson method correct to five decimal places.

*6.213*

Or

- (b) Solve the equation  $x^3 + x^2 - 1 = 0$  for the positive root by iteration method.

12. (a) Using Lagrange's interpolation formula find  $y(10)$  from the following table

$x$	5	6	9	11
$y$	12	13	14	16

Or

- (b) Obtain the least square polynomial approximation of degree one and two for  $f(x) = x^{\frac{1}{2}}$  on  $[0, 1]$ .

13. (a) Derive Trapezoidal rule.

Or

- (b) Evaluate  $I = \int_0^6 \frac{dx}{1+x}$  using Simpson's one-third rule.

14. (a) Using Taylor series method find  $y(1.1)$  and  $y(1.2)$  correct to four decimal places given

$$\frac{dy}{dx} = xy^{\frac{1}{2}} \text{ and } y(1) = 1.$$

Or

- (b) Obtain the values of  $y$  at  $x = 0.1, 0.2$  using Runge-Kutta second order

$$\frac{dy}{dx} = -y, \text{ given } y(0) = 1$$

15. (a) Classify the given partial differential equation

$$u_{xx} + 4u_{xy} + (x^2 + 4y^2)u_{yy} = \sin(x+y).$$

Or

- (b) Solve  $\nabla^2 u = 8x^2y^2$  for the square mesh given  $u = 0$ , on the 4 boundaries dividing the squares into 16 sub-squares of length 1 unit.

PART C — (5 × 8 = 40 marks)

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

16. (a) Solve the system Gauss-Elimination method.

$$2x + 3y - z = 5$$

$$4x + 4y - 3z = 3$$

$$2x - 3y + 2z = 2$$

Or

6/4 [3

16. (b) Solve the system of equations by Gauss-Jordan method.

$$\begin{aligned}x + 2y + z &= 3 \\2x + 3y + 3z &= 10 \\3x - y + 2z &= 13.\end{aligned}$$

17. (a) Find the values of  $y$  at  $x = 21$  and  $x = 28$  from the following data.

$x:$	20	23	26	29
$y:$	0.3420	0.3907	0.4383	0.4848

Or

(b) From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 46 and 63

Age:	45	50	55	60	65
Premium:	114.84	96.16	83.32	74.48	68.48

18. (a) Evaluate the integral  $I = \int_{-1}^1 \int_{-1}^1 \frac{dx dy}{x+y}$  using the

Trapezoidal rule with  $h_x = h_y = 0.5$  and  $h_x = h_y = 0.25$ .

Or

(b) Find the value of the integral

$$I = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos 2x}{1 + \sin x} dx \text{ using Gauss-Legendre two}$$

and three point integration rules.

19. (a) Obtain  $y(0.6)$  given  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$  with

$h = 0.2$  by Adam's method

Or

(b) Using Euler's method, solve numerically the

equation  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$  for

$x = 0.0 (0.2) (1.0)$  check your answer with the exact solution.

20. (a) Solve  $\frac{\partial^2 u}{\partial x^2} = 2 \frac{\partial u}{\partial x} = 0$  given

$u(0, t), u(4, t), u(x, 0) = x(4 - x)$  assuming  $h = 1$ . Find the values of  $u$  upto  $t = 5$ .

Or

(b) Solve Laplace's equation  $u_{xx} + u_{yy} = 0$  in a bounded Region  $R$  with boundary  $c$ .

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(6 pages)

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Reg. No. : .....

Code No. : 7655

Sub. Code : ZNNM 34

M.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2023.

Third Semester

Nanoscience and Nanotechnology — Core

RESEARCH METHODOLOGY

(For those who joined in July 2021–2022)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. How to judge the depth of any research?

(a) By research title

(b) By research duration

(c) By research objectives

(d) By total expenditure on research

2. Which of the following is not the method of research?

(a) Survey

(b) Historical

(c) Observation

(d) Philosophical

3. Research is

(a) Searching again and again ✓

(b) Finding solution to any problem

(c) Working in a scientific way to search for truth of any problem

(d) None of the above

4. In the process of conducting research 'Formulation of hypothesis' is followed by

(a) Statement of objectives

(b) Analysis of data

(c) Selection of research tools

(d) Collection of data

5. The main objective of \_\_\_\_\_ study's to acquire knowledge.

(a) Exploratory ✓

(b) Descriptive

(c) Diagnostic

(d) Descriptive and diagnostic

6. A formal document that presents the research objectives, design of achieving these objectives, and the expected outcomes/deliverables of the study is called
- (a) Research design (b) Research proposal  
(c) Research hypothesis (d) Research report ✓
7. What are the core elements of a research process?
- (a) Introduction; data collection; data analysis; conclusions and recommendations  
(b) Executive summary; literature review; data gathered; conclusions; bibliography  
(c) Research plan; research data; analysis; references  
(d) Introduction; literature review; research methodology; results; discussions and conclusions ✓
8. Final stage in the research process is
- (a) Problem formulation  
(b) Data collection  
(c) Data analysis  
(d) Report writing ✓
9. A comprehensive full report of the research process is called
- (a) Thesis ✓ (b) Summary report  
(c) Abstract (d) Article

10. The first page of the research report is
- ✓(a) Appendix (b) Bibliography  
(c) Index (d) Title page

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 characteristics of research.  
Or  
(b) Explain about conceptual vs empirical research.
12. (a) Discuss briefly the problem formulation in research. ✓  
Or  
(b) Write the guidelines for evaluating research problem.
13. (a) Explain the sampling and observational design.  
Or  
(b) Outline the features of research design. ✓



Scholar

14. (a) Explain the methods of data collection in research.

Or

(b) What are the categories of research? Explain it.

15. (a) Write the concept of citation index.

Or

(b) Define impact factor. Write measures to maintain research.

PART C — (5 × 8 = 40 marks)

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

16. (a) Outline the difference between quantitative and qualitative research.

Or

(b) Explain the methods of descriptive research.

17. (a) Explain the formulation of research objectives.

Or

(b) Explain the source of literature review.

18. (a) Write the important concept relating to research design.

Or

(b) Explain the laws and theories of research design.

19. (a) Explain the structure and components of scientific reports in research.

Or

(b) Explain quotation and footnotes.

20. (a) Explain ethics in research.

Or

(b) Outline the distinction between citation and reference.

(7 pages)

Reg. No. : 18201

Code No.: 5649

Sub. Code: ZNNM 22

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Second Semester

Nano Science and Nano Technology – Core

SYNTHESIS 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. How can the transport of nanoparticles in low-density media be enhanced?
- (a) By increasing the size of the nanoparticles
- (b) By increasing the viscosity of the fluid
- (c) By decreasing the temperature of the system
- (d) By adding surfactants to the fluid

2. Which of the following factors can affect nanoparticle transport in low-density media?
- (a) Particle size
- (b) Fluid viscosity
- (c) Temperature
- (d) All of the above
3. What is meant by the term "aerosol" in the context of spray pyrolysis?
- (a) A gas containing suspended nanoparticles
- (b) A liquid droplet containing precursor molecules
- (c) A solid particle formed by the reaction of precursor molecules
- (d) A high-energy plasma containing reactive species
4. How does the addition of surfactants to the precursor solution affect the nanoparticles produced by spray pyrolysis?
- (a) It has no effect on the nanoparticles
- (b) It increases the size of the nanoparticles
- (c) It decreases the size of the nanoparticles
- (d) It can change the morphology of the nanoparticles

5. Which of the following types of nanoparticles are commonly used in polymer nanocomposites?
- (a) Metal nanoparticles
  - (b) Carbon-based nanoparticles
  - (c) Ceramic nanoparticles
  - (d) All of the above
6. How are nanoparticles incorporated into polymer nanocomposites?
- (a) By physically mixing the nanoparticles with the polymer
  - (b) By covalently bonding the nanoparticles to the polymer
  - (c) By electrostatically adsorbing the nanoparticles onto the polymer
  - (d) All of the above
7. What is the role of the catalyst in the CVD synthesis of carbon nanotubes?
- (a) To provide a substrate for nanotube growth
  - (b) To control the diameter and chirality of the nanotubes
  - (c) To promote the reaction between carbon-containing gases
  - (d) All of the above

8. Which of the following carbon-containing gases is commonly used in CVD synthesis of carbon nanotubes?
- (a) Methane
  - (b) Ethane
  - (c) Acetylene
  - (d) All of the above
9. What is the role of the nanoparticle in a nanocomposite material?
- (a) To act as a filler and improve mechanical properties
  - (b) To act as a catalyst for chemical reactions
  - (c) To act as a stabilizer for the matrix material
  - (d) To act as a colorant for the composite material
10. What is a nanogrinding process?
- (a) A method of producing nanoparticles by chemical reactions
  - (b) A method of reducing the size of nanoparticles by physical means
  - (c) A method of creating nanocomposite materials
  - (d) A method of assembling nanotubes into specific configurations

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 chemical vapor deposition method for synthesis of nanomaterials.

Or

- (b) Give the Nucleation theory for synthesis of nanomaterials.

12. (a) Discuss the pulsed laser deposition advantages and disadvantages.

Or

- (b) How does molecular beam epitaxy work?

13. (a) Discuss about alumino silicate gel.

Or

- (b) Explain the fundamentals of sol-gel process.

14. (a) Explain the laser methods.

Or

- (b) List out the properties of nanotubes.

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15. (a) Discuss in detail shell structures.

Or

- (b) Explain micro and meso porous materials.

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 vapour nanophase thermodynamics.

Or

- (b) Give an account of aggregate formation in synthesis of nanoparticles.

17. (a) With a neat diagram explain spary pyrolysis for thin film deposition.

Or

- (b) Discuss in detail about chemical vapour deposition of thin films.

18. (a) Discuss about Zirconia and yttrium gel.

Or

- (b) Describe the Pecheni method.

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19. (a) Explain the plasma arcing.

Or

- (b) Discuss the detail arcing in the presence of cobalt.

20. (a) Explain the Inorganic Hybrids in synthesis of nano materials.

Or

- (b) Discuss in detail nanocomposites and nano grained materials.

(6 pages)

Reg. No. : 2022B1951R201

Code No. : 7654

Sub. Code : ZNNM 33

M.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2023.

Third Semester

Nanoscience and Nanotechnology – Core

BASICS OF NANOBIO TECHNOLOGY

(For those who joined in July 2021 – 2022)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Nanobiotechnology deals with materials of the size

- (a) 1 / 1000000000
- (b) 1 / 100000000
- (c) 1 / 10000000000 ✓
- (d) 1 / 100000000000

2. The study and application of molecular building blocks for the fabrication of electronic components is called as

- (a) electronics
- (b) microelectronics
- (c) molecular electronics ✓
- (d) macroelectronics

3. A circular array of iron atoms on a copper surface is called as a

- (a) quantum dot ✓
- (b) quantum corral
- (c) both (a) and (b)
- (d) a alone

4. Buckyballs are made up of

- (a) nickel
- (b) DNA
- (c) RNA
- (d) carbon ✓

5. Which one of the following technology is used in making memory chips?

- (a) Nano design
- (b) Nanofabrication
- (c) Microassay ✓
- (d) Tissue engineering

6. The art and science of etching, writing or printing at the microscopic level in the order of nanometer is

- (a) NEMS
- ✓(b) nanolithography
- (c) nanofabrication
- (d) nano paltcinins

7. The process used to create topographical features on a surface by selective removal of material by physical or chemical means is called

- ✓(a) etching
- (b) bonding
- (c) lithography
- (d) writing

8. Nanoparticles are surface functionalized for

- (a) Preventing aggregation
- (b) Specific drug targeting
- (c) Diagnosis and sensing
- ✓(d) All of the above

9. Expand NCAM

- ✓(a) Nano Carbon Array Membrane
- (b) Nano Carbon Assay Membrane
- (c) Nano Capillary Array Membrane
- (d) Nano Capillary Assay Membrane

10. Mechanics and Electronics that are on the nanoscale are called as

- ✓(a) MEMS
- (b) NEMS
- (c) MEM
- (d) NEM

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 future of nanoparticles and manufacturers.

Or

✓(b) Write the applications of inorganic nanoparticles.

12. (a) Write a note on organic nanoparticles.

Or

✓(b) Explain Bio derived templates with examples.

13. (a) Explain term

- (i) nanotubes,
- (ii) nanocomposites,
- (iii) nanocoatings.

Or

(b) Explain nanoparticles in invivo imaging.

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(7 pages)

Reg. No. : .....

Code No. : 5650

Sub. Code : ZNNM 23

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Second Semester

Nanoscience and Nanotechnology

### PROPERTIES 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. What is ionic polarization?
  - (a) The polarization caused by the movement of electrons in a material
  - (b) The polarization caused by the movement of ions in a material
  - (c) The polarization caused by the orientation of dipoles in a material
  - (d) The polarization caused by the stretching of a material

2. What is dipole polarization?
  - (a) The polarization caused by the movement of electrons in a material
  - (b) The polarization caused by the movement of ions in a material
  - (c) The polarization caused by the orientation of dipoles in a material
  - (d) The polarization caused by the stretching of a material
3. What is magnetism?
  - (a) The ability of a material to conduct electricity
  - (b) The ability of a material to produce a magnetic field
  - (c) The ability of a material to change shape under an applied force
  - (d) The ability of a material to emit light under certain conditions
4. What is ferromagnetism?
  - (a) The type of magnetism exhibited by all materials
  - (b) The type of magnetism exhibited only by magnetic materials
  - (c) The type of magnetism exhibited only by non-magnetic materials
  - (d) The type of magnetism exhibited by materials at very low temperatures

5. What is the shape dependence of the Moss Effect?
- (a) The effect is stronger in spherical nanoparticles
  - (b) The effect is stronger in non-spherical nanoparticles
  - (c) The effect is the same in all nanoparticle shapes
  - (d) The effect does not depend on the shape of the nanoparticle
6. What is the potential application of the Moss Effect?
- (a) In the development of more efficient solar cells
  - (b) In the development of stronger structural materials
  - (c) In the development of faster computer processors
  - (d) In the development of new medical devices
7. How does microhardness change as the size of a material decreases to the nanoscale?
- (a) It increases
  - (b) It decreases
  - (c) It remains the same
  - (d) It depends on the specific material
8. What is the mechanism behind the change in microhardness in nanomaterials?
- (a) Grain size reduction
  - (b) Surface area reduction
  - (c) Changes in crystal structure
  - (d) Changes in chemical composition
9. What is the relationship between particle size and melting point depression in nanomaterials?
- (a) The smaller the particle size, the greater the melting point depression
  - (b) The smaller the particle size, the less the melting point depression
  - (c) The particle size has no effect on melting point depression
  - (d) The relationship between particle size and melting point depression is unpredictable
10. What is the potential application of melting point depression in nanoscience?
- (a) In the development of novel phase change materials for thermal energy storage
  - (b) In the development of stronger and more durable materials
  - (c) In the development of more effective drug delivery systems
  - (d) In the development of more accurate sensors



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 concept of activation energy.

Or

(b) Discuss the different types of dielectric loss mechanisms.

12. (a) Discuss in detail super paramagnetism.

Or

(b) Explain about magnetostriction.

13. (a) Discuss in detail Moss effect.

Or

(b) Explain the Munk function.

14. (a) Distinguish between Hardness and micro hardness.

Or

(b) Explain the compressive strength.

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19. (a) Explain the elastic and plastic deformation.

Or

(b) Explain the following.

(i) Fracture

(ii) Toughness.

20. (a) Explain the Specific heat capacity.

Or

(b) Discuss in detail melting - point depression.

15. (a) Discuss in detail glass transition temperatures.

Or

(b) Write a note on strain.

PART C -- (3 × 8 = 24 marks)

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

16. (a) Describe the Double Schottky potential barrier Height model.

Or

(b) Write a note on Dielectric constant and dielectric loss.

17. (a) Explain the Giant and colossal magnetoresistance.

Or

(b) Explain the classification of magnetic materials.

18. (a) Explain the Batho and hypochromic effects.

Or

(b) Discuss in detail effective mass approximation theory.

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Code No. : 7652

Sub. Code : ZNNM 31

M.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2023.

Third Semester

Nano science and Nano Technology-Core

CHARACTERIZATION OF NANOMATERIALS

(For those who joined in July 2021 - 2022 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- Collimators used in XRD are made up of  
(a) Thin quartz tube (b) Thin glass plates  
(c) Thin metal plate (d) All of the above
- Image formation in electron microscope is based on  
(a) column length  
(b) electron number  
(c) differential scattering  
(d) specimen size
- The waveguides are materials with characteristics of  
(a) Low bulk resistivity  
(b) High bulk resistivity  
(c) High conductivity  
(d) Low conductivity
- Coating the nano crystals with the ceramics is carried that leads to \_\_\_\_\_  
(a) Corrosion (b) Corrosion resistant  
(c) Wear and tear (d) Soft
- In FT-IR initially spectra is recorded as  
(a) Volts vs time  
(b) % Transmittance vs concentration  
(c) Absorbance vs Concentration  
(d) Absorbance vs time

- Which of the following is the most common instrument for photographic recording of diffraction patterns?  
(a) Debye-Scherrer powder camera  
(b) Gamma camera  
(c) Geiger tube  
(d) Scintillation counter
- Which of the following is not a measurement method for hardness?  
(a) Scratch hardness (b) Indentation  
(c) Rebound hardness (d) Elongation hardness
- What type of wear occurs due to an interaction of surfaces due to adhesion of the metals?  
(a) Adhesive wear (b) Abrasive wear  
(c) Fretting wear (d) Erosive wear
- The resolving power of TEM is derived from  
(a) electrons (b) specimens  
(c) power (d) ocular system

- The wavelength range of the UV spectrum?  
(a) 100 nm to 500 nm (b) 200 nm to 800 nm  
(c) 300 nm to 1000 nm (d) 400 nm to 1600 nm

PART B — (5 × 5 = 25 marks)

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

- (a) Describe the neutron diffraction method.  
Or  
(b) Outline the comparison of X ray and neutron scattering
- (a) What is the difference between abrasion resistance and wear resistance  
Or  
(b) Explain What type of stress causes fatigue failure.
- (a) Describe the working principle of Scanning microscopy analysis  
Or  
(b) Describe the working principle of Scanning Tunneling Microscope

14. (a) Write note Surface Plasma Excitation.

Or

(b) Explain solar energy absorbents using nanoparticles

15. (a) Describe UV – Visible Spectroscopy

Or

(b) Write applications of photoluminescence

PART C — (5 × 8 = 40 marks)

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

16. (a) Derive scherrer Equation

Or

(b) Explain role for neutron scattering in nanoscience

17. (a) Explain interaction of light with nanosystems

Or

(b) Explain Nanoindentation

18. (a) Explain the working of TEM in analyzing nanoparticles

Or

(b) Discuss briefly about Nanotweezers

19. (a) Explain interaction of light with nanosystems

Or

(b) Discuss briefly Photonic Crystals

20. (a) Describe uv vis method for Band gap measurement

Or

(b) Discuss briefly antimicrobial Studies.

15. (a) Explain generation of Spin Polarization.

Or

(b) Discuss briefly Spin filters

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Outline the Challenges and present future of nanotechnology

Or

(b) Explain tools for micro and nanofabrication

17. (a) Explain characterization of switches in molecular electronic component

Or

(b) Explain rectifier with neat diagram

18. (a) Explain construction and working of Single Electron transistor

Or

(b) Explain Quantum dots with application

19. (a) Discuss briefly about Molecular Circuits

Or

(b) Explain architecture of Nanocomputer

20. (a) Discuss briefly about Spin relaxation and spin dephasing

Or

(b) Explain spintronic devices and applications

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Sub. Code : ZNNM 33

M.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2023

Third Semester

Nanoscience and Nanotechnology – Core

NANOELECTRONICS

(For those who joined in July 2021-2022 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The Technology is used in making memory chips  
(a) Nanodesign (b) Nanofabrication  
(c) Microassay (d) tissue engineering
- Nanopowder are defined as powders having an average particle size of less than \_\_\_\_\_ nm  
(a) 100 (b) 1000  
(c) 10 (d) 1
- Quantum dots are \_\_\_\_\_ in nature  
(a) inorganic (b) organic  
(c) biologic (d) metallic

4. Nanomembranes have a pore size of  
(a) 1nm-10nm (b) 1 nm-100nm ✓  
(c) 0.1 nm- 1nm (d) 100nm-1000nm
5. Which technique is used in the making of biochips?  
(a) Nanolithography  
(b) microlithography  
(c) Nanotechnology  
✓(d) DNA chip technology
6. The study and application of molecular building block for the fabrication electronic component is called as \_\_\_\_\_  
(a) electronics  
(b) microelectronics  
✓(c) molecular electronics  
(d) macroelectronics
7. Expand MED  
✓(a) Magnetic Electronic diode  
(b) Memory enhancing drugs  
(c) Both (a) and (b)  
(d) (b) only
8. Which of the following are application of Quantum dots?  
(a) Immunolabelling and Fluorescence imaging  
(b) Drug delivery  
(c) As tags for other drug carries  
✓(d) All the above

9. A mathematical description with properties of nerve cells or neurons is called  
(a) neuron  
(b) nerve cell  
(c) Biological neuron ✓  
(d) biological nerve cell
10. Devices that utilize the spin properties of electrons for their functionality is known as \_\_\_\_\_ device  
(a) Electronic (b) Spintronic ✓  
(c) Molecular (d) Magnetic

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 theory of nanoelectronics  
Or  
(b) Write note on Nanofabrication
12. (a) Discuss briefly complex molecular devices  
Or  
(b) Explain polyphenylene based chain in molecular electronics
13. (a) Discuss briefly Quantum wires.  
Or  
(b) Explain Nanoelectronics architecture
14. (a) Write note on QCA quantum cellular Automata  
Or  
(b) Outline application of Nanocomputers