LOGANATHA NARAYANASAMY GOVT. COLLEGE (Autonomous), PONNERI – 601 204
APRIL 2020 SEMESTER EXAMINATIONS
IV SEMESTER – M.Sc., PHYSICS

Paper Code : **17PHE4A** Title of the Paper : **Nano Science And Technology**
DATE **: 24.09.2020 FN** Time : **90 Minutes** Maximum Marks : **75 Marks**

PART – A

Answer any **FIVE** Questions from the following

1. What is nanotechnology?
2. Mention few properties that change at nano scale.
3. What are quantum dots?
4. What is Quantum confinement?
5. Define lithography.
6. What is meant by surfactant? Give one example of a surfactant.
7. What is the principle of SEM?
8. Mention the application of Atomic Force Microscope.
9. Write few industrieswhich use nanotechnology.
10. What are Nanosensors used for?
11. What are the unique properties of Buckyballs?
12. Define Photonic crystals.

PART – B

Answer any **THREE** Questions from the following

13. Briefly discuss the History of nanotechnology.
14. Mention applications of Carbon Nano Tubes.
15. Explain soft lithography.
16. Give the comparison of SEM Vs TEM
17. Explain Sol – gel processing method of synthesising nano materials.
18. Write a note on E-beam lithography.
19. Briefly explain how is nanotechnology used in solar cells.

PART – C

Answer any **TWO** Questions from the following

20. Discuss the size dependent properties at the nanoscale.
21. What are the synthesis methods available for the preparation of carnonnano tubes? Explain them.
22. Write a short note on
    a) Laser ablation b) Sputtering.
23. With neat diagram explain the principle and working of Transmission Electron Microscope (TEM)
24. Discuss about the applications of Nanotechnology in Agriculture and Automotive industry.

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APRIL 2020 SEMESTER EXAMINATIONS
IV SEMESTER – M.Sc., PHYSICS

Paper Code : **17PHM4A** Title of the Paper : **Condensed Matter Physics**

DATE **: 23.09.2020 FN** Time : **90 Minutes** Maximum Marks : **75 Marks**

PART – A

Answer any **FIVE** Questions from the following

1. What is meant by structure factor?
2. Mention the steps involved in finding the Miller indices of a plane.
3. What is Brillouin zone?
4. State any two properties of phonons.
5. Write Wiedemann Franz law.
6. What is de Hass Van Alphen effect?
7. How is ferrimagnetic materials differ from ferromagnetic materials?
8. State the properties of magnons?
9. What is salient about the cooper pair?
10. What are SQUIDS?
11. What are DC and AC Josephson effects?
12. What is Hall effect?

PART – B

Answer any **THREE** Questions from the following

13. Obtain the reciprocal lattice vectors of a bcc crystal structure.
14. Explain normal and Umklapp processes in a solid.
15. How is Fermi surfaces constructed? Explain.
16. Explain the quantum theory of paramagnetism.
17. Explain type I and type II superconductors,
18. Explain any two crystal structures with their features.
19. Explain Meissner effect.

PART – C

Answer any **TWO** Questions from the following

20. Explain the construction of a reciprocal lattice to a direct lattice. Also obtain the reciprocal lattice to SC, BCC and FCC lattices.
21. Explain Debye theory of lattice heat capacity.
22. Discuss Kronig-Penney model for the energy band structure of solids.
23. Elaborate the theory of antiferromagnetism at, below and above Neel temperatures, based on the molecular theory.
24. Discuss the BCS theory of superconductivity. And state few applications of superconductivity.

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APRIL – 2020 SEMESTER EXAMINATIONS
IV SEMESTER – M.Sc., PHYSICS

Paper Code: **PHE4A** Title of the Paper**: Elective - Nano Science and Technology**

DATE: **24.09.2020 FN** Time: **90 Mins.** Maximum Marks: **75 Marks**

PART – A

Answer any **FIVE** Questions from the following

1. What are nano rods?
2. Define plasma arching.
3. Define nano dots.
4. Explain nano manipulator.
5. What is Nanolithography?
6. How nano particles are used as chemical reagents?
7. Define nano technology.
8. What are nano holes?
9. What are ageless materials?
10. Define nano mechanics.
11. What are micromechanical systems?
12. Define the melting point of nano particle material.

PART – B

Answer any **THREE** Questions from the following

13. Discuss about the classification of nano materials?
14. Explain the synthesis of metal nano paricles and its structures.
15. Discuss about the variation of magnetism with size of nano materials.
16. Explain the uses of nano tubes and its applications.
17. Discuss about optoelectronic devices and its applications.
18. Explain the specific heat of nano particle crystals.
19. Write note on quantum electronic devices.

PART - C

Answer any **TWO** Questions from the following

20. Explain (i) Sol-Gel deposition (ii) Ball milling technique.
21. Write note on Cadmium telluroid and Cadmium Sulfide nano crystals.
22. Explain in detail the estimation of nano particle size using AFM.
23. Discuss in detail the preparation and properties of carbon nano tubes.
24. Explain about DNA Chip and drug delivery systems.

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APRIL – 2020 SEMESTER EXAMINATIONS
IV SEMESTER – M.Sc., PHYSICS

Paper Code: **PHE4B** Title of the Paper**: Elective - Nano Science and Technology**

DATE: **24.09.2020 FN** Time: **3 Hours** Maximum Marks: **75 Marks**

PART – A

Answer any **FIVE** Questions from the following

1. What are nano rods?
2. Define plasma arching.
3. Define nano dots.
4. Explain nano manipulator.
5. What is Nanolithography?
6. How nano particles are used as chemical reagents?
7. Define nano technology.
8. What are nano holes?
9. What are ageless materials?
10. Define nano mechanics.
11. What are micromechanical systems?
12. Define the melting point of nano particle material.

PART – B

Answer any **THREE** Questions from the following

13. Discuss about the classification of nano materials?
14. Explain the synthesis of metal nano paricles and its structures.
15. Discuss about the variation of magnetism with size of nano materials.
16. Explain the uses of nano tubes and its applications.
17. Discuss about optoelectronic devices and its applications.
18. Explain the specific heat of nano particle crystals.
19. Write note on quantum electronic devices.

PART - C

Answer any **TWO** Questions from the following

20. Explain (i) Sol-Gel deposition (ii) Ball milling technique.
21. Write note on Cadmium telluroid and Cadmium Sulfide nano crystals.
22. Explain in detail the estimation of nano particle size using AFM.
23. Discuss in detail the preparation and properties of carbon nano tubes.
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APRIL – 2020 SEMESTER EXAMINATIONS
IV SEMESTER – M.Sc., PHYSICS

Paper Code : **PHM4A** Title of the Paper **: Research methodology, Computational methods & Programming in C**

DATE : **23.09.2020 FN** Time: **90 Mins.** Maximum Marks: **75 Marks**

PART – A

Answer any **FIVE** Questions from the following

1. Define a research problem.
2. What do you meant by scientific research?
3. What are the uses of tabulation in research?
4. Write Simpson's 3/8 rule.
5. State the uses of numerical integration.
6. Write the Newton's forward interpolation formula.
7. Write down the correct order of mathematical operators in mathematics and computer programming?
8. What are the rules for identifiers?
9. What is an array?
10. Write the syntactic rules to be governed for declaring a multidimensional array.
11. What are user defined functions.
12. State the types of return values.

PART – B

Answer any **THREE** Questions from the following

13. Discuss the use of literature survey in undergoing research.
14. Briefly explain the concept of synopsis writing.
15. Solve the following equation by Gauss-Seidal method.

    $10x-5y-2z=3$

    $4x-10y+3z=-3$

    $x+6y+10z=-3$

16. Apply Gauss's formula to obtain f(x) at x=3.5 from the table given below

X	:	2	3	4	5
f (x)	:	2.626	3.454	4.784	6.986

17. What is an operator? List out the significance of logical bitwise operators with example.
18. What is looping in C? What are the different types of loop statements used in C and list out their advantages.
19. Discuss functions with no arguments but returns a value with example.

PART - C

Answer any **TWO** Questions from the following

20. Explain the art of writing a research paper and thesis in detail.

21. (a) Derive the Lagrange's interpolation formula for unequal intervals.

    (b) Using Lagrange's interpolation formula find y (9.5),given

x :	7	8	9	10
y (x)	3	1	1	9

22. (i) Explain in detail the basic structure of C-programming and programming style.

    (ii).Explain various constants, variables and data types in C

23. (i) Explain two dimensional array with an example to show how it is stored in memory

    (ii) Explain the various control statements in 'C' with examples

24. Explain different categories of user defined function in detail with example for each.

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APRIL – 2020 SEMESTER EXAMINATIONS
IV SEMESTER – M.Sc., PHYSICS

Paper Code : **PHM4B** Title of the Paper **: Material Science and Laser Physics**

DATE : **23.09.2020 FN** Time: **90 Mins.** Maximum Marks: **75 Marks**

PART – A

Answer any **FIVE** Questions from the following

1. What is corrosion? How will you control it?
2. Explain the term intermetallic compounds with example
3. Illustrate the Schottky and Frenkel defects with brief explanation
4. What is meant by slip? Illustrate it with diagram
5. What are traps and recombination centres?
6. Explain the term activators and co-activators
7. What is meant by viscoelastic behavior?
8. What do you understand by anelastic behaviour
9. State the importance of optical resonator
10. What are advantages and disadvantages of semiconductor laser
11. Give the applications of laser in medicine
12. What are creep and creep resistance?

PART – B

Answer any **THREE** Questions from the following

13. What is meant by creep? Explain its mechanisms
14. Discuss the effect of solute atoms on dislocation motion
15. What is meant by ferroelectricity? State the properties of it.
16. Write short notes on composite materials.
17. Derive an expression for Einstein co-efficient and hence give the condtition for population inversion.
18. Explain with diagrams the various surface defects.
19. Obtain an rate level equation for three level system.

PART - C

Answer any **TWO** Questions from the following

20. a) Explain the iron-carbon system by drawing its phase diagram and equilibrium of various phases. (7)
    b) Give the Hume-Rothery's rules (3)
21. With a diagram discuss the dislocations in detail. Also explain Burger vector for both dislocations.
22. Deduce an expression for the local field for structure possessing cubic symmetry and hence obtain Claussius-Mosotti equation.
23. Discuss i) Polymerization mechanism and ii) polymer structures.
24. Explain the vibration modes of CO2 molecule and working of CO2 laser with energy level diagram.

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APRIL – 2020 SEMESTER EXAMINATIONS
IV SEMESTER – M.Sc., PHYSICS

Paper Code : **PHM4C** Title of the Paper **: Solid State Physics**

DATE : **23.09.2020 FN** Time: **90 Mins.** Maximum Marks: **75 Marks**

PART – A

Answer any **FIVE** Questions from the following

1. What are Miller indices? Draw any one lattice plane with its indices.
2. What is Madelung constant?
3. Differentiate group and phase velocities.
4. What are Umklapp processes?
5. What is de Haas Van Alphen effect? State its importance.
6. State Bloch theorem.
7. Define curie point and Neel temperature.
8. Draw the variation of susceptibility of ferri magnetic materials with temperature.
9. Define DC and AC Josephson effect.
10. What are cooper pairs? How are they different from ordinary electron - electron pairs?
11. What are magnetic levitation? Where is it used?
12. State Weidemann - Franz law.

PART – B

Answer any **THREE** Questions from the following

13. Derive an expression for the cohesive energy of an ionic crystal.
14. Show that the number of modes of lattice vibrations in a mono atomic lattice equals the number of mobile atoms.
15. Obtain the energy eigen levels of a free electron gas in three dimensions.
16. Explain the theory of anti ferromagnetism.
17. Distinguish type I and type II superconductors.
18. State the nature of entropy and heat capacity of a superconductor and explain.
19. Compare the properties of ferro and para magnetic materials.

PART - C

Answer any **TWO** Questions from the following

20. i. Show that the reciprocal lattice to FCC lattice is BCC lattice. (7)
    ii. Find the reciprocal lattice to a simple cubic lattice.(3)
21. Based on Debye's theory, derive an expression for the specific heat capacity of solids in terms of Debye temperature.
22. Elaborate the theory of motion of an electron in a simple periodic potential well with Kronig-Penny model and mention the results.
23. Discuss the theory of domains in a ferromagnetic material and thermodynamically estimate the energy of formation of Bloch wall.
24. Derive London equations of superconductivity and hence an expression for the penetration depth.

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APRIL – 2020 SEMESTER EXAMINATIONS
IV SEMESTER – M.Sc., PHYSICS

Paper Code: **PHM4E** Title of the Paper**: Condensed Matter Physics**

DATE: **23.09.2020 FN** Time: **90 Mins.** Maximum Marks: **75 Marks**

PART – A

Answer any **FIVE** Questions from the following

1. Draw a diagram to explain Bragg's law.
2. Define crystals.
3. What are phonons?
4. Define the phase velocity.
5. Define mobility in semiconductors.
6. Give Wiedemann-Franz law.
7. State Hund's rules for the ground state.
8. What are magnons?
9. Define the Cooper pair in superconductivity.
10. What is meant by the coherence length in superconductors?
11. What is meant by atomic packing factor?
12. Draw the hysteresis loop for a ferromagnet.

PART – B (5 X 5 = 25 Marks)

Answer any **THREE** Questions from the following

13. Derive an expression for the cohesive energy of ionic gas crystals.
14. What are the merits of Debye's theory of lattice heat capacity over Einstein's model?
15. Explain the schematics of electron occupancy in allowed energy bands for metals and semiconductors.
16. Explain the concept of ferromagnetic domains.
17. Explain the BCS theory of Superconductivity.
18. Discuss about the Umklapp process in thermal conductivity.
19. Write short note on SQUIDS.

PART – C (3 X 10 = 30 Marks)

Answer any **TWO** Questions from the following

20. Discuss in detail the different types of crystal binding with examples.
21. Obtain the expression for the specific heat of solids as per Debye theory. Discuss the results.
22. Show that the concentration of electrons and holes is equal for intrinsic semiconductor.
23. Discuss the quantum theory of paramagnetism.
24. Derive London equation. Show that London equation leads to Meissner effect.

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