| Roll No. | | | | | | | | | **25-PH-41** |

M.Sc. IV SEMESTER [MAIN/ATKT] EXAMINATION MAY - JUNE 2025

PHYSICS

Paper - I

[Condensed Matter Physics - II]

[Max. Marks : 75]   *[Time : 3:00 Hrs.]*   *[Min. Marks : 26]*

Note : Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt all five questions. Each question carries an internal choice.
Each question carries **15 marks.**

Q. 1 a) Define type - I and type - II superconductors.

  b) Explain the formation of cooper pair in superconductor. Obtain an expression for the energy gap in a superconductor at absolute zero temperature.

OR

  a) What is Spin Wave and Magnons ?

  b) Describe the Heisenberg's interaction of the origin of Weiss molecular field. Relate the exchange integral to the origin of Weiss constant and ferromagnetic curie temperature.

Q. 2 a) What are Crystal Defects and how they classified ?

  b) What is Dislocation ? Show that the energy of a screw dislocation is proportional to square to Burger Vector (b^2)

OR

  a) What is Diffusion and on what variable it depends ?

  b) The energy of formation of a vacancy in copper is 1 ev. Estimate the relative change in the density of copper due to vacancy formation at a temperature just below its melting point 1356 k.

Q. 3 a) Explain the chemical vapour deposition method for preparation of thin films.

  b) How electrical properties of thin films deter from bulk material ? Deduce the expression of electrical conductivity in case of continuous metallic film.

OR

a) Differentiate between classical Hall effect and quantum size Hall effect.

b) What is the principle of multiple beam interferrometry ? Write down the conditions for high precision measurements.

Q. 4 a) Draw the density of state of three - , two - , one - , zero - dimensional materials.

b) Explain the electronic, vibrational and mechanical properties of carbon nano tube.

OR

a) What is Chiral vector of carbon nano tube ? Define the nature of a carbon nano tube on the basis of chiral vector.

b) Write down different methods of preparation of nano materials. Discuss the preparation of Nickel nano particles

Q. 5 Attempt **any three** -

i) What is Graphene and Carbon Nanotube ?

ii) Calculate the film thickness for unit(01) step height and unit (01) fringe spacing.

iii) Distinguish between ferromagnetic, ferrimagnetic and antiferro magnetic substances.

iv) B.C.S. Theory of Superconductivity.

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