Reg. No. | | | | | | | | | |

PHS 553

Fourth Semester M.Sc. Degree Examination, Sept./Oct. 2022
(CBCS)
PHYSICS
Condensed Matter Physics – III

Time : 3 Hours Max. Marks : 70

***Instruction** : Answer **any four full** questions, choosing **one** from **each** Part **(I – IV)** and **any two** questions from Part – **V**.*

PART – I

1. a) Describe the classical field theory of ferromagnetism and compare the results with experiment. **10**

   b) Qualitatively describe the use of neutron diffraction for magnetic structure analysis. **5**

2. a) Explain the domain structure in ferromagnetic materials. **7**

   b) Describe Ising model of ferromagnetism. **8**

PART – II

3. a) Describe the application of molecular field theory for antiferromagnetic arrangement of atomic moments. **10**

   b) Write a note on spinels and garnets. **5**

4. a) Describe the molecular field theory of ferrimagnetism. **10**

   b) Explain the formation of magnetic bubbles and give their important properties. **5**

PART – III

5. a) Describe the paramagnetic susceptibility in an alternating magnetic field. **8**

   b) Explain the construction and working of ESR spectrometer. **7**

6. a) Obtain Bloch equations and introduce the concept of relaxation times. **7**

   b) Give the basic principle of NMR and explain NMR spectrometer. **8**

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PART – IV

7. a) Describe mechanical attrition, lithography and methods of synthesis of nanomaterials. **9**

   b) Explain the Metal-Organic Chemical Vapor Deposition (MOCVD) method. **6**

8. a) What are surfactants ? Explain the size-controlled synthesis of nanoparticles using surfactants. **8**

   b) Explain the synthesis of nanomaterials by nanolithography and soft lithography using scanning probe methods. **7**

PART – V

9. Answer **any two** questions from the following :

   a) State and explain Bloch $T^{3/2}$ law. **5**

   b) Explain the meaning of indirect exchange interaction in anti-ferromagnetic material. **5**

   c) Explain spin-lattice relaxation in a two-level system. **5**

   d) Give the general applications of nanomaterials. **5**

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