MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

UG Model question paper

Time: 3 hours **Engineering Physics** **Max Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

Section-I

1. a) Derive an expression for cohesive energy of molecule. [10M]
   b) Explain the formation of covalent bond in a solid. [4M]

OR

2. a) Explain with neat diagrams the 7 crystal systems and 14 Bravais Lattices. [9M]
   b) What are Miller Indices and explain a procedure to find Miller indices for a crystal plane. [5M]

Section-II

3. a) State and explain Bragg's Law with a neat diagram. [6M]
   b) Discuss how X-ray powder method can be used for the determination of crystal parameters. [8M]

OR

4. a)Derive an expression to estimate the concentration of frenkel defects in a crystal at any giventemperature. [10M]
   b) What is Burger's vector? Explain [4M]

Section-III

5. a)Derive an expression for electronic and ionic polarization of dielectric material. [10M]
   b) Derive the Classius –Mossotti relation. [4M]

OR

6. a)Define electric susceptibility, polarization vector and electric displacement vector. [4M]
   b) Derive an expression for internal field in a dielectric material with neat diagrams where needed. [10M]

Section-IV

7. a) Derive an expression for Bhor magneton. [8M]
   b) What is Meissner effect? Explain. [6M]

OR

8. a) Explain different types of superconductors. [8M]
   b) What is hysteresis and explain the Hysteresis loop on the basis of domain theory. [6M]

Section-V

9. a) Discuss about the origin for nanotechnology. [6M]
   b) Explain the synthesis of nano materials by sol-gel technique. [8M]

OR

10. a) Explain in brief the SEM techniques of nano material characterization. [9M]
    b) Give some applications of nano materials. [5M]

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Section-I

1. Derive an expression for equilibrium spacing of two atoms and also derive an expression fordissociation energy or Cohesive energy of a diatomic molecule. [14M]

OR

2. Discuss about seven crystal systems and their corresponding Bravias Lattices with neat Sketchs [14M]

Section-II

3. a) State Bragg's law of X-ray diffraction and describe powder diffraction method of determination of crystal structure. [10M]
   b) X –rays of wave length 1.5418 A^0 are diffracted by (1 1 1) planes in a crystal at angle of 30^0 in the first order. Calculate the inter atomic spacing of the crystlal. [4M]

OR

4. a) Derive an expression for the concentration of Schottky defect in an ionic crystal. [10M]
   b) Explain the significance of Burger's vector [4M]

Section-III

5. a) Derive an expression for electronic and ionic polarization of dielectric material. [10M]
   b) Derive the Classius –Mossotti relation. [4M]

OR

6. a) Explain Polarization vector , displacement vector and electric susceptibility. [4M]
   b) What is piezo electricity ? Explain. [4M]
   c) Give any three applications of dielectric materials. [6M]

Section-IV

7. a) Differentiate Ferro and Anti ferro magnetic materials. [6M]
   b) Explain Hysteresis loop on domain theory. [8M]

OR

8. a)Discuss Meissner effect [6M]
   b)Write about Type I and Type II superconductors. [8M]

Section-V

9. a)What are nanomaterials? Distinguish Nanoscience and Nanotechnology. [6M]
   b) Describe any two methods of fabricating nanomaterials. [8M]

OR

10. a) Explain how do you use TEM to characterize nonoparicles. [6M]
    b) Mention any five applications of nanomaterials . [8M]

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Section-I

1. a) Deduce an expression for cohesive energy between two atoms forming a bond. [10M]
   b) Explain brief about primary bonds [4M]

OR

2. a) Show that FCC has the highest packing fraction of the three cubic crystal systems. [7M]
   b) What are the Miller indices and explain a procedure to find Miller indices for a crystal plane. [7M]

Section-II

3. a) Derive an expression to estimate the concentration of Schottky defects. [10M]
   b) What is Burger's vector ? Explain. [4M]

OR

4. a) Discuss how X-ray powder method can be used for the determination of crystal parameters. [8M]
   b) For a cubic crystal with lattice parameter 'a' find the inter – planar spacing for planes (2 3 1), (1 0 1) amd (2 1 1) [6M]

Section-III

5. a) Derive an expression for electronic and ionic polarisability of a material. [10M]
   b) Write the applications of dielectric material. [4M]

OR

6. a) Obtain an expression for the internal field of cubic structure (Lorentz Field) [10M]
   b) Find the electric susceptibility of a dielectric gas having dielectric constant of 1.000041[4M]

Section-IV

7. a) Differentiate Dia, Para, Ferro magnetic materials with neat diagrams where needed. [6M]
   b) Differentiate hard and soft magnetic material. [5M]
   c) Explain the terms Magnetization, Retentivity and Coercivity. [3M]

OR

8. a) What is Meissner effect? Explain. [7M]
   b) Describe the difference between Type-I and Type – II super conductors. [7M]

Section-V

9. a) Explain the preparation of Sol – gel method. [6M]
   b) Discuss about surface to volume ratio of nano materials. [4M]
   c) Explain the classification of nano materials. [4M]

OR

10. a) What is Quantum confinement ? [4M]
    b) Explain the characterization of nano particles by SEM and TEM. [8M]
    c) Write the applications of nano materials. [2M]

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Section-I

1. a) What are secondary bonds and explain each of them? [7M]
   b) What is cohesive energy and obtain an expression for cohesive energy showing graphically the variation of attractive and repulsive potential energy with respect to inter atomic distance? [7M]

OR

2. a) What are Bravais lattice? Describe them in combination with crystal systems? [5M]
   b) Calculate the co ordination number and APF in case of FCC structure? [4M]
   c) Derive an expression for inter planar distance between two successive planes? [5M]

Section-II

3. a) What is Bragg's law of X-ray diffraction? Explain? [4M]
   b) Describe in detail powder method to determine the crystal structure? [6M]
   c) A beam of X-rays is incident on an ionic crystal with lattice spacing 0.313 nm. Calculate the wavelength of X-rays if the first order Bragg reflection takes place at a glancing angle $7^0 48^{1.}$ [4M]

OR

4. a) What is Burger vector? In what direction do the Burger vector lie with respect to i. An Edge dislocation ii. Screw dislocation? [7M]
   b) Derive an expression for concentration of Frenkel defect in an ionic crystal? [7M]

Section-III

5. a) Obtain the relevant mathematical expression for i. Electronic polarizability and ii. Ionic polarizability? [7M]
   b) What is internal field and Derive an expression for calculation of internal field in a dielectric material? [7M]

OR

6. a) Distinguish between Ferro- electricity and Piezo – electricity? [7M]
   b) Derive Classius- Mosotti relation? [7M]

Section-IV

7. a) Define the terms magnetic induction (B), magnetization (M) and magnetic field (H). Obtain an expression relating to those quantities? [7M]
   b) Explain, in detail, the hysteresis of a ferromagnetic material? [7M]

OR

8. a) Distinguish between diamagnetic and paramagnetic materials? [4 M]
   b) Super conductors exhibits perfect diamagnetism- Explain? [6M]
   c) Discuss the applications of super conductor? [4M]

Section-V

9. a) Write notes on:
   i. Nano scale ii. Quantum confinement and iii. Surface to volume ratio? [7M]
   b) Describe the processes of "physical vapour deposition" in the fabrication of nano structures? [7M]

OR

10. a) Describe the processes of Sol Gel method in the fabrication of nano structures? [7M]
    b) Explain how TEM can be used to characterize nano particles? [7M]

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Section-I

1. a) Derive an expression for minimum potential energy of a molecule? **[7M]**
   b) Explain the formation of Ionic-bond with an example? [**7M]**

OR

2. a) Show that FCC is the most closely packed of the three cubic structures by working out the packing factors? **[8M]**
   b) Define Miller-indices. Sketch the following atomic planes in a simple cubic structure (010),(110) and (111). [**6M]**

Section-II

3. a) Describe with a suitable diagram, the powder method for the determination of crystal structure. **[8 M]**
   b) Derive Bragg's law of X-ray diffraction in crystals? **[6M]**

OR

4. a) Derive an expression for concentration of Frenkel defect in an ionic crystal. **[10M]**
   b) Write notes on 'point defects' in crystals. [**4M]**

Section-III

5. a) Define the following terms i) Electric susceptibility ii) Electric polarization iii)Dielectric constant ? [**4M]**
   b) Describe Lorentz method to calculate the internal field of a cubic structure? [**10M]**

OR

6. a) Explain the electronic polarizability in atoms and obtain an expression for electronic polarizability in terms of the radius of the atom.? **[8M]**
   b) Explain Clausius-Mosotti relation in dielectrics subjected to static field. **[6M]**

Section-IV

7. a) Define magnetic moment? Explain origin of magnetic moment at the atomic level. **[7M]**
   b) Explain the hysteresis loop observed in Ferro-magnetic materials. [**7M]**

OR

8. a) What is Meissner effect? Explain. **[6M]**
   b) Explain domain theory of Ferro-magnetism.? **[7M]**

Section-V

9. a) Describe the basic principles of nano-materials. **[4 M]**
   b) Explain the principle and working of PVD technique? **[10M]**

OR

10. a) Explain in detail the sol-gel method to prepare nano-materials? **[10M]**
    b) Describe the XRD method to characterize nano -materials.? **[4M]**