I yr. II Semester-2017-18

Branch: Civil

Subject: Engineering Physics

Short answer questions

1. Explain the terms : i) Space lattice and ii) Basis
2. What are the lattice parameters and how are they used to describe a unit cell in three dimensions?
3. Name the seven crystal systems and their possible respective bravais lattices.
4. Iron has BCC structure with atomic weight 55.85 and density 7860 kg/m^3. Find the lattice constant.
5. Obtain the miller indices of a plane which intercepts at a, b/2 and 3c in a simple crystal unit cell.
6. Classify point defects in crystals? Explain.
7. What is the intensity of sound and how is it measured?
8. Define the terms i) Reverberation and ii) Reverberation time for sound waves.
9. Define the sound absorption coefficient of a material? Give examples for sound-absorbing materials.
10. Distinguish between air-borne noise and structure-borne noise.
11. What do you mean by the Echelon effect? Suggest a remedy for it.
12. Calculate the reverberation time for an auditorium with volume of 1500 m^3 and total absorption is 100 m^2 Sabines.
13. Explain the principle behind visual inspection. Why is the optical aid required in visual inspection?
14. What is the basic principle behind liquid penetrant testing? Explain.
15. What is meant by transducer? How is it used in ultrasonic testing?

Long answer questions

1. a) Show that FCC crystals are more closely packed than simple cubic and body centered cubic crystals.
   b) Copper has FCC structure and its atomic radius is 0. 128nm.Calculate its density. Take the atomic weight of copper as 63.5 gram per mol.

2. Describe in detail HCP crystal structure and calculate its packing fraction.

3. a) Compare the structure of Zinc blende with that of Diamond.
   b) Silicon has the structure of diamond. If the unit cell has an edge of 0.542 nm, find the nearest inter-atomic separation in it.

4. Deduce the relation between inter planar distance'd' and the Miller indices of the Planes for the cubic crystal.
   Describe, in detail, Laue method for the determination of a crystal structure.

5. Derive Bragg's law of X-ray diffraction.
   Describe, in detail, Debye-Scherer method for the determination of crystal structure.

6. a) Derive an expression for concentration of schottky defects in an ionic crystal.
   b) Calculate the glancing angle of the (110) plane of a simple cubic crystal of lattice parameter 2.814Å corresponding to second order diffraction maximum for the X-rays of wavelength 0.71Å.

7. a) Derive the expression for the growth and decay of the energy density inside a hall and hence deduce Sabine's mathematical relation for reverberation time of the hall.
   b) A hall has a volume of 12500 m^3 and a reverberation time of 1.5 sec. If 200 cushioned chairs are additionally placed in the hall, what will be the new reverberation time of the hall? The absorption of each chair is 1 O.W.U.

8. a) Define the term absorption coefficient. Explain in detail any experimental method used to measure the absorption coefficient.
   b) A hall has dimensions 20 X 15 X 5 m^3 has the reverberation time of 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.

9. a) Explain the various factors that affect the architectural acoustics. What are their remedies?
   b) The intensity of sound produced by thunder is 0.1 W m^{-2}. Calculate the intensity level in decibels.

10. Explain briefly how the surface flaws are detected using liquid penetrant testing. What are its applications and limitations?

11. What is the basic principle in ultrasonic testing? Explain with neat sketch the different testing methods used in ultrasonic testing.

12. What is thermography? Explain with neat sketch the working of thermography camera and its applications.