M.Sc.(Physics) (CBCS Pattern) Sem-III

PSCPHYT10 - Core Paper-X : Solid State Physics and Spectroscopy

P. Pages : 2 **GUG/W/22/11296**

Time : Three Hours Max. Marks : 80

Either:

1. a) Calculate the packing fraction in crystal for. **8**

i) S. C.

ii) F. C. C.

iii) B.C.C. in structure treating the atom as sphere.

b) Explain 2D and 3D lattices in details. **8**

OR

e) State the properties of a reciprocal lattice. Prove that FCC lattice is reciprocal to BCC lattice. **10**

f) Explain Miller indices with example. **6**

Either:

2. a) Prove that $\frac{\in -1}{\in +2} = \frac{4\pi}{3} N\alpha_a$ by using Clausius – Mossotti relation. **8**

b) What is dislocation. Discuss Burger's vector and Burger's circuit. **8**

OR

e) Classify ferroelectric materials and discuss theories of ferroelectricity. **10**

f) Write short note on polarization mechanism. **6**

Either:

3. a) Explain width of spectral line and discuss mechanism of homogeneous and inhomogeneous broadening of spectral line. **10**

b) Discuss quantum states of an electron in an atom. **6**

OR

e) State and explain Franck – Condon principle. **8**

f) Explain the Spectrum of alkali atom. **4**

g) Explain the hyperfine structure. **4**

Either:

4. a) Explain the concept of ESR spectroscopy. **8**

b) Explain vibration spectrum of diatomic molecules. **8**

OR

e) Explain Raman effect. Describe the experimental set- up to study it. Outline the theory of Raman Effect. **8**

f) Discuss NMR Spectroscopy in detail. **8**

5. Answer all the followings.

a) Determine Miller indices of a plan which cuts intercepts in the ratio. **4**

i) 1a : 3b : -2c ii) 4a : 6b : 3c

along the three axes.

b) Discuss dislocation reactions. **4**

c) Write short note on Auger transitions. **4**

d) What are the salient features of molecular electronic spectra. **4**

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