

- Q.2 a. Draw crystal system & unit cell for the following Bravais Lattices.
(i) Cubic (ii) Orthorhombic (8)

Answer:

Table 3.1 Page 26 of Text book I
(I & II)

- b. Discuss bond energy, bond type and bond length in chemical bonds. (8)

Answer:

Article 4.4 Page 63 of Text book I

- Q.3 a. Calculate the packing efficiency and the density of diamond. (8)

Answer:

Effective number of atoms in the DC unit cell

$$= \left(\frac{1}{8} \times 8\right) + \left(\frac{1}{2} \times 6\right) + 1 \times 4$$

corner atoms face centred atoms atoms in Unit cell

$$= 8$$

Volume of each atom = $\frac{4}{3} \pi r^3 = \frac{4}{3} \pi \left(\frac{a\sqrt{3}}{8}\right)^3$
here r is radius of atom & a is Lattice Parameter

Packing efficiency = $\frac{\text{Volume of atoms in unit cell}}{\text{Volume of unit cell}}$

$$= \frac{8 \left(\frac{4}{3}\right) \pi \left(\frac{a\sqrt{3}}{8}\right)^3}{a^3}$$

$$= 0.34$$

Density = $\frac{\text{Mass of atoms in unit cell}}{\text{Volume of unit cell}}$

$$= \frac{12 \times 1.66 \times 10^{-27} \times 8}{(3.57 \times 10^{-10})^3}$$

$$= 3500 \text{ Kg/m}^3$$

- b. Discuss the following using suitable examples: (8)
(i) Point Imperfection
(ii) Screw Dislocation

Answer:

(i) Article 6.1 Page 121 of Textbook I
(ii) Article 6.2 Page 129 of Textbook I

- Q.4 a. Discuss Fick's First & Second laws of diffusion. (8)

Answer:

Article 8.1 Page 179 of Textbook I

- b. What is current density in metals? How it depends on mobility of electrons?
Calculate mobility of electron in copper. (8)

Answer:

Articles 2.6 & 2.7 Page 92 of Textbook II

- Q.5 a. Discuss the following: (4+4)

- (i) Ionic polarization
(ii) Dipolar polarization

Answer:

Article
4.5 Page 143 of Textbook II

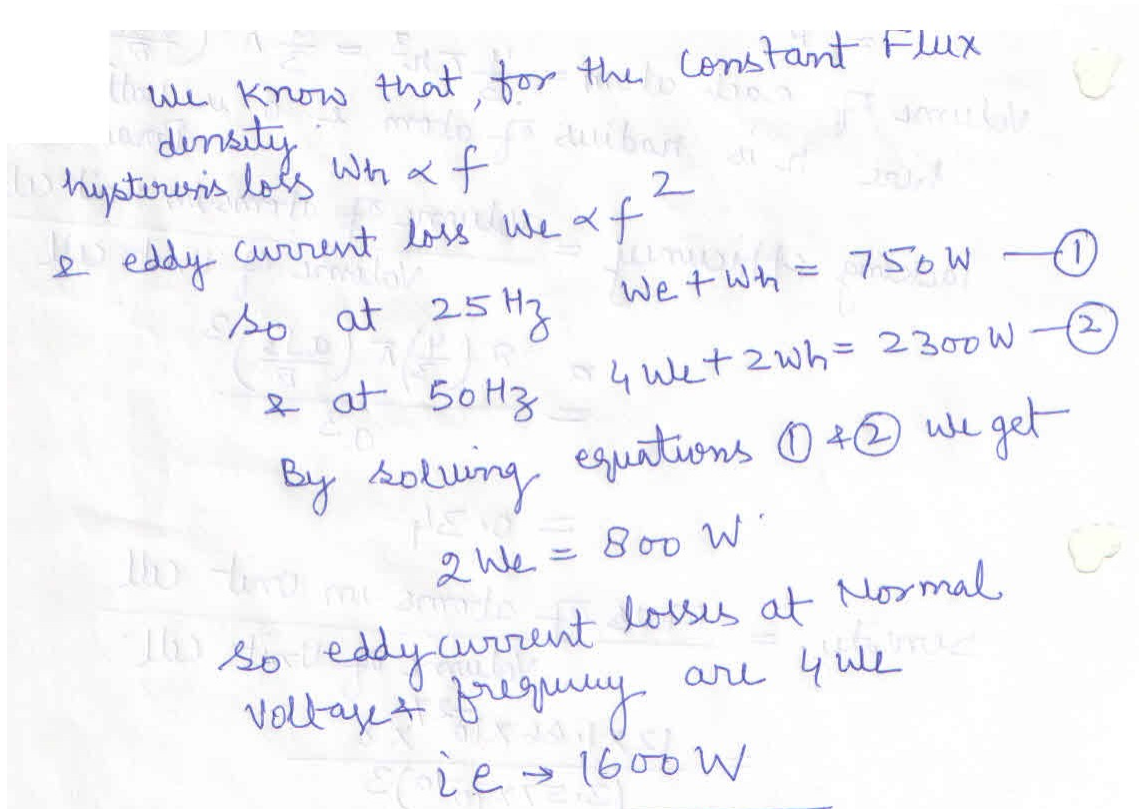
- b. Explain breakdown of the solid, liquid & gaseous dielectrics. (8)

Answer:

Article 5.11.1 Page 171 of Textbook II

- Q.6 a. In a 440 V, 50 Hz transformer, the total iron loss is 2300 W. When the applied voltage is 220 V at 25 Hz, the total iron losses are 750W. Calculate the eddy current loss at the normal voltage & frequency. (4)

Answer:



b. Explain the following:

(12)

- (i) Magnetostriction
- (ii) Ferrites
- (iii) Hysteresis Loop

Answer:

(i) Article 6.11 Page 214 of Text book II
 (ii) Article 6.15 Page 220 of Text book II
 (iii) Article 6.10 Page 211 of Text book II.

Q.7 a. With the help of diagrams, explain the formation of energy bands in P-type and N-type semiconductors. (8)

Answer:

Article 7.4 Page 240 of Text book II

b. Discuss the following:

(8)

- (i) Diffusion in semiconductors
- (ii) Electrical conductivity of doped materials

Answer:

(i) Article 7.8 Page 253 of Text book II
 (ii) ~~Article~~ Article 7.12 Page 259 of Text Book - II

Q.8 a. What is barrier capacitance? Derive the expression for the barrier capacitance. (8)

Answer:

Article 8.3 Page 277 of Text book - II

b. Write applications of the following: (2×4)

- (i) Thermistors
- (ii) Wire wound resistor
- (iii) Ceramic dielectric capacitors
- (iv) Inductors

Answer:

(i) Article 8.7(i) Page 290 " " "
 (ii) " 12.2(vii) Page 354 " " "
 (iii) " 12.3(v) Page 362 " " "
 (iv) " 12.4 Page 367 " " "

Q.9 Discuss the following: (8×2)

- (i) Linear operation of JFET
- (ii) Fabrication of junction transistors

Answer:

(a) " 14.9.1 Page 402 " " "
 (b) " 14.6 Page 395 " " "

TEXT BOOK

Materials Science and Engineering – A First Course by V. Raghavan, Fifth Edition, Thirty-Fourth Print, April 2007 Edition, Prentice-Hall Of India Pvt Ltd

Introduction to Electrical Engineering Materials by C.S. Indulkar and S. Thiruvengadam, 4th Edition, Reprint 2006, S. Chand and Company Ltd