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SB-3520

M. Sc. (Part - II) Examination

March / April – 2011

Physics : Paper - III

(Spl. Material Science-II)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **M. Sc. (Part - 2)**

Name of the Subject :

☛ **Physics - 3**

☛ Subject Code No. : **3 5 2 0** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Answers to the two sections must be written in separate answer books.

(3) Symbols have their usual meaning.

(4) Simple calculators are allowed to use.

(5) Figures to right indicate full marks of the question.

SECTION - I

1 (a) Show that the minimum cation-to-anion radius ratio for a coordination number of 3 is 0.155. **4**

(b) State the two characteristics of the component ions that determine the crystal structure for a ceramic compound. Discuss any two crystal structure for A_X compounds. **7**

2 (a) Explain ultrahigh molecular weight Polyethylene, liquid crystal polymers and thermoplastic elastomers. **7**

(b) State the application of ferrites and explain its use in microwave application. **5**

OR

2 (a) Describe in detail the polymerization process. **7**

(b) Mention the function that an integrated circuit Package must perform and discuss what do you understand by lead frame design and wire bonding. **5**

3 (a) Discuss zero dimensional defects (point defects) and derive an expression for the concentration of Frenkel defects. **7**

(b) Explain Debye Scherrer method in detail used for determining lattice parameter of polycrystalline material. **5**

OR

3 (a) Which X-ray diffraction method do you know for determine single crystalline behaviour of a material ? Describe the method in which crystal is kept fixed and wavelength of X-ray is changed. **7**

(b) Explain Weissenberg method used for determining the six lattice parameters of single crystal in detail. **5**

SECTION - II

4 (a) Write characteristic of vacuum in detail. **3**

(b) Discuss holography. How it is used in NDT ? **4**

(c) What are the criterion for a film to be thin film ? Give the difference thin film and thick film now-a-days. **4**

5 (a) Explain the working principle of Gaedc rotary oil pump. What is the usefulness of the ballast device introduced in the pump ? Explain with diagrams. **4**

(b) In a thin film deposition process, the vapour pressure of material at 50 °C is 10 Torr, molecular weight is 156 and the gas constant per mole is 8.321. Find the rate of evaporation. Given Avograde number = 6.022×10^{23} mol^{-1}. **4**

(c) Write short note on Penning Gauge. Write advantages and limitation of pump. **4**

OR

5 (a) Explain the process of sputtering and define sputtering yield. Also explain what is glow discharge phenomena. **4**

(b) Explain the working of roots pump with proper diagrams. What are the benefits of this pump over rotary pump ? **4**

(c) Explain why diffusion pump cannot be used without a fore pump. Explain function of Bottle. **4**

6 (a) What are the methods of electron beam heating for sources evaporation ? Explain each of them with proper diagram. 4

(b) Define anodization. Explain the basic principles with chemical reactions occurring in the respective electrodes. 4

(c) Show that the deposit distribution for uniformly emitting point source onto a place is $\frac{t}{t_0} = \left[1 + \left(\frac{x}{4}\right)^2\right]^{-3/2}$ 4

OR

6 (a) Drawing a neat sketch of transmission electron microscope. explain in detail its construction and working. 5

(b) Explain in detail the eddy current method of non-destructive method. Explain the importance of crucial parameters of the test coil. 4

(c) Write a note on ellipsometry and enlist it advantages. 3