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SB-3516

M. Sc. (Part - II) Examination

March / April – 2011

Physics : Paper - II

(SPL : Material Science - I)

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 : Paper - 2**

☛Subject Code No. : **3 5 1 6** ☛Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Answer 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 questions.

SECTION - I

1 (a) Explain the following terms : **3**

(i) Ceramics

(ii) Phase diagram

(iii) Elastomers.

(b) What is solid solution? **4**

Explain

(i) Substitutional solid solution and

(ii) Interstitial solid solution and their phase diagrams. Write two examples of each in alloy system.

(c) An Aluminium crystal slips on (111) Plane and in **4**
the (110) direction, with a 3.5 MPa stress applied in the $(1\bar{1}1)$ direction. Determine the value of critical resolved shear stress.

2 (a) Why it is essential for a materials engineer to have the systematic classification of materials? Explain the classification of engineering materials in detail. 7

(b) The force of attraction between ions of Na and Cl is 3.02×10^{-9} N when the two ions just touch each other. Find the radius of Cl^-....ion. (Given : Ionic radius of Na^+ ion is $0.95A^o$, $e=1.6x10^{-19}C$, $Eo=8.854 \times 10^{-12}C^2/N\text{-}m^2$). 5

OR

2 (a) Explain the significance of Phase diagram in material science. Explain noncrystalline and composite systems in reference to phase diagrams. 7

(b) (i) What is the essential distinction between cast iron and steel? 5

(ii) Which portion of a composite contributes most of the strength?

3 (a) "A structure-property-performance relationship provides a systematic approach to material's selection and behaviour." Briefly justify this statement. 7

(b) Explain X-Ray diffraction pattern of a liquid state. Comment on your results. 5

OR

3 (a) What is deformations? State the types of deformations in materials and explain any two types of deformation in detail. 7

(b) Which part has the greater stress : (i) a rectangular aluminum bar of 24.6 mm × 30.7 mm cross section, under a load of 7640 kg or (ii) a round steel bar whose cross sectional dia-meter is 12.8 mm, under a 5000 kg load? 5

SECTION - II

4 (a) Explain magnetization and magnetic susceptibility for magnetic materials. 3

(b) What is the important of energy band gap in optical properties? 3

(c) Define Woods and Tool Steels. 3

(d) What is meant by Population inversion in LASER? 2

5	(a)	Explain the properties of solid in the base of magnetic material.	**4**
	(b)	Define magnetic Bubble. Write the use of Soft magnetic material.	**4**
	(c)	Show that reluctance (R) is directly propotional to the ratio of flux path and cross section area.	**4**

OR

5	(a)	Explain optical properties of non metals.	**4**
	(b)	Give three examples of optical Phenomena not involving the visible spectrom.	**4**
	(c)	To calculate the energy of a Photon in infrared light with a wavelength of 10^{-5} m, (where 1J=0.625 eV)	**4**
6	(a)	Which three factors are control a typical of Phase transformation?	**4**
	(b)	What do you understand by the Word "Growth" ? Discuss on the growth of nuclei?	**4**
	(c)	Chromium steel are a stainless steel or not? Why?	**2**
	(d)	Which steel should be used for following applications. (i) Bus and Truck Gear (i) Grinding and Crushing Machinery.	

OR

6	(a)	Explain construction and working of He-Ne LASER.	**4**
	(b)	Explain Fiber optics communication. What is the function of LASER in optical communication? Why are used LASER?	**4**
	(c)	Derive the equation for two Phase composite material.	**4**