

**B.Tech. MECHANICAL ENGINEERING
(BTMEVI)**

Term-End Examination

December, 2013

BIME-005 : MATERIAL SCIENCE

Time : 3 hours

Maximum Marks : 70

*Note : There are seven questions. Attempt any five questions.
All questions carry equal marks.*

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1. (a) Discuss the significance of bond energy of solids. Derive its expression relating the bonding force 7
(b) What is the importance of Miller indices ? 7
How does it help in study of Crystallography ?
 2. (a) Derive the expression for relation between atomic radius and lattice constant in case of (i) BCC (ii) F.C.C. and (iii) SC 7
(b) The conventional stress in stress-strain curve is lower than the true stress-strain curve in tension, while opposite is true in compression. Why ? 7
 3. (a) Explain Gibb's phase rule. In this light narrate total number of variables and degrees of freedom. 7
(b) List five ores of iron and explain the process of manufacturing of pig iron. 7

4. (a) Write short notes on the following stating their applications : 7
(i) Cyaniding
(ii) Flame hardening
(iii) Nitriding
(b) List four alloys from non-ferrous metals. Write their composition properties and applications. 7
5. (a) What are the effects of dipole moments on magnetic behaviour of materials ? 7
(b) Classify solids on the basis of energy gap in them. Name them and compare their properties and characteristics. 7
6. (a) Differentiate between the following : 7
(i) Toughness and Resilience
(ii) Ductility and brittleness
(b) What is etching ? Why is it necessary before microscopic studies ? Name different etching agents. 7
7. Write down the short notes on **any four** : 14
(a) Cladded Metals
(b) Crystalline and Non-Crystalline Ceramics
(c) Slip Casting and Tape Casting
(d) Injection and blow moulding
(e) Calendering and Casting
(f) Hysteressis loss
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