

Total No. of Questions—8]

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Seat No.	
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**[5057]-215**

**S.E. (Mechanical/Automobile)**  
**(First Semester) EXAMINATION, 2016**  
**MATERIAL SCIENCE**  
**(2012 PATTERN)**

**Time : Two Hours**

**Maximum Marks : 50**

**N.B. :—** (i) Answer Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6,  
Q. No. 7 or 8.

(ii) Figures to the right indicate full marks.

(iii) Draw the neat sketch wherever necessary.

1. (a) What do you mean by 'Burger vector' ? Explain it on the basis of types of line dislocations. What is its importance in plastic deformation ? [6]
- (b) Differentiate between 'thermosetting and thermoplastic polymer'. [2]
- (c) Explain properties of polymers. [4]

*Or*

2. (a) What do you mean by the term 'Miller indices' ? Explain the procedure for finding Miller indices for planes. [4]
- (b) What do you mean by the term cold working ? [2]
- (c) Explain what do you mean by a metal matrix composite ?  
A metal matrix composite is made with 6061 aluminum alloy and 47 volume percent of silicon carbide fibers continuous in one direction. Calculate the elastic modulus of composite if the modulus of elasticity of 6061 aluminum alloy is 69 GPa and that of silicon carbide is 400 GPa. [6]

P.T.O.

3. (a) Suggest the suitable hardness tester with its range of working load, type of indenter in the following hardness number : [6]  
HRc 54, KHN 32, VHN 540.
- (b) Explain Ultrasonic test with a neat diagram, its principle, advantages, disadvantages and applications. [7]

*Or*

4. (a) Identify the methods of NDT on the basis of principle of working : [5]
- (i) Liquid is applied on a metallic surface, which gets enter into the cracks which are open to surface.
  - (ii) The two probes are placed apart on the job and large current is passed through it.
  - (iii) High frequency sound waves passed through the cracks in straight line through a solid body.
  - (iv) The metal component being inspected is exposed to radiations.
  - (v) An alternating current is passed through a coil and the metal component to be tested is exposed to changing electromagnetic field of the coil.
- (b) Explain the working principle of Gamma-Ray radiography NDT method. [2]
- (c) Explain fatigue test on the basis of working principle and use of S-N curve. [4]
- (d) What is notch toughness ? [2]
5. (a) Explain the mechanical methods used in manufacturing powders. [7]
- (b) Why it is important stage of blending and mixing in powder metallurgy ? Explain different types of mixer used in industry for this application. [6]

*Or*

- 6.** (a) With the self explanatory diagram explain the stages of compaction of metal powder. [7]  
(b) Which are secondary operations carried out in powder metallurgy ? [6]
- 7.** (a) Explain property requirements in biomaterial with *one* example in detail. [4]  
(b) Explain in detail carbon nanotube with respect to its properties manufacturing advantages, disadvantages and application. [8]

*Or*

- 8.** Write short notes on : [12]  
(i) Smart materials  
(ii) Biosensor  
(iii) Shape memory alloy.