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Seat No.	
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[4757]-1015

S.E. (Mechanical/Automobile) (First Semester)

EXAMINATION, 2015

MATERIAL SCIENCE

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

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

(ii) Figures to the right indicate full marks.

(iii) Draw the neat sketch wherever necessary.

1. (a) What do you mean by the term 'Unit Cell' ? Define various lattice parameters. [4]
- (b) Differentiate between cold working and hot working according to temperature, variation in mechanical properties, grain formation and areas of application. [4]
- (c) What is composite material ? Explain with classification and types. [4]

Or

2. (a) What do you mean by the term 'Polymer' ? Explain with types, characteristics and applications. [4]

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- (b) What do you mean by the term 'ceramic' ? Explain with types, properties and application. [4]
- (c) Derive the expression for deformation of single crystal by slip ? State the condition for geometrical hardening and geometrical softening. [4]
3. (a) What is the concept of True stress and True strain ? Derive the relations between them also find out the condition for necking. [5]
- (b) What do you mean by the term 'Hardness of the material' ? Explain any *four* testing methods for checking the hardness of the material. [4]
- (c) What do you mean by 'non-destructive testing' ? Explain ultrasonic method of testing with working principle, advantages and drawbacks. [4]

Or

4. (a) Identify the methods of NDT in the following cases : [5]
- (i) Cavities, cracks or region of variable density for the metal/non-metallic components manufactured by casting, welding and forging etc.
- (ii) To sort out dissimilar metals and detect differences in their composition, microstructure etc.
- (iii) Detecting internal defects such as cracks, porosity and laminations in metallic and non-metallic components during or after production.

- (iv) Various kinds of flaws in ferromagnetic components made from various welding, castings and forging etc.
- (v) Invisible cracks, porosity and other similar defects on the surface of components made up of metal, non-metal, plastic, glass etc.
- (b) Explain with working principle the material test for the component which shows a plastic deformation under constant stresses for a longer time at high temperatures. Draw the type of possible microstructure during this test. [4]
- (c) What is the purpose of 'Impact Test' ? Explain with types and the factors affecting the impact values of the component. [4]
- 5. (a) Define the term 'powder metallurgy' with steps of processing and classification of powder manufacturing processes. [5]
- (b) What do you mean by the term 'sintering' ? Explain the stages of sintering. [4]
- (c) Explain the role of powder metallurgy for manufacturing of 'cemented carbide' ? [4]

Or

- 6. (a) Explain powder metallurgy with characteristics of metal powders, advantages, disadvantages and areas of applications. [5]
- (b) What do you mean by conditioning of metal powders ? Explain with purpose and different processing stages. [4]

- (c) What is a 'self-lubricated bearing' ? Explain the role of powder metallurgy for manufacturing of 'self-lubricated bearings'. [4]
7. (a) Explain the following terms (any *two*) : [4]
- (i) Piezometric materials
 - (ii) Soft and hard ferrites
 - (iii) Super-conductors.
- (b) What do you mean by the term 'biomaterials' ? Explain with different types ? [4]
- (c) Explain the concept of 'shape memory alloy' with advantages, disadvantages and applications. [4]

Or

8. (a) Explain the following terms (any *two*) : [4]
- (i) Cryogenic applications of smart materials
 - (ii) Modern materials for high temperature applications
 - (iii) Dielectric materials.
- (b) Explain the concept of nano-science and technology. [4]
- (c) Explain 'Biosensors' with principle, advantages and applications. [4]