Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5252]-114

S.E (Mechanical/Automobile) (I Semester) EXAMINATION, 2017

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 space lattice ? Write any *three* imperfections in crystals/lattices with example of each. [4]

(*b*) What is plastic deformation in materials ? Differentiate between slip and twinning. [4]

(*c*) What do you mean by isostress and isostrain condition in composite materials ? Calculate the composite modulus for polyester reinforces with 60 volume % E-glass under isostrain conditions. (Take Young modulus for polyester 6.9 GPa and for glass it is 72.4 GPa). [4]

Or

2. (*a*) What do you mean by the term 'Polymer' ? Differentiate between Thermoplastic and Thermosetting polymers. [4]

(*b*) What do you mean by Composite Materials ? Explain with its types and classification. [4]

(*c*) What do you mean by "True stress and True Strain in Materials" ? Derive the relationship between both of it. [4]

P.T.O.

3. (*a*) What is the difference between Hardness and Toughness of the material ? Explain any *two* Testing methods for checking the hardness of the material with their principle of working and mathematical formula for calculation. [5]

(*b*) What is Notch Toughness in Impact Test ? List out the factors by which the Impact values of materials get affected. [4]

(*c*) What do you mean by 'Non-destructive Testing ? Explain Radiography Method of Testing with working Principle, Advantages & Applications. [4]

Or

4. (*a*) Identify the methods of material testing in the following cases : [5]

(*i*) To Measure Hardness of cast components, heterogeneous materials like cast irons and porous powder metallurgy components.

(*ii*) To measure the properties like electrical conductivity, magnetic permeability, grain size, heat treatment conditions, hardness and physical dimensions.

(*iii*) To test large sized, uniform thickness and one/many components at the same time.

(*iv*) In quality control test for detecting internal defects such as cracks, porosity and laminations in metallic and non-metallic components during or after the production.

(*v*) Materials working for a continuous high temperature service under stressed conditions such as jet engine components, gas and steam turbines, nuclear reactors and tungsten filaments for electric bulbs.

(*b*) Expalin the working principle of Fatigue Test Machine ? What are the different protection methods of fatigue life ? [4]

(*c*) What do you mean by the term 'creep fracture' ? What are the requirements for creep resistant materials ? [4]

5. (*a*) Define the term 'powder metallurgy' ? List out its various applications specifying example for each of them. [5]

(*b*) What are the various properties of powder material that should be evaluated in powder metallurgy process ? [4]

(*c*) What are the steps involved in the production of a 'refractory materials' using powder metallurgy ? [4]

Or

6. (*a*) Explain the classification of various processes used to manufacture the powder in powder metallurgy process. [5]

(*b*) What do you mean by sintering of metal powders ? Explain with purpose and different processing stages ? [4]

(*c*) What are the steps involved in the production of a 'diamond impregnated tools' using powder metallurgy ? [4]

7. (*a*) Explain the following terms (any *two*) : [4]

(*i*) Biomaterials

(*ii*) Shape memory alloy

(*iii*) Superconductors

(*b*) What do you mean by the term Piezometric materials ? Explain with types. [4]

(*c*) Explain the Magnetic Material. Differentiate Between Hard and Soft magnetic Materials. [4]

Or

8. (*a*) Explain the following terms (any *two*) : [4]

(*i*) Nanomaterials

(*ii*) Biosensors

(*iii*) Dielectric materials

(*b*) Explain the concept of smart materials and its Cryogenic applications. [4]

(*c*) Explain 'The Modern materials for high temperature applications'. [4]