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

Seat No.	

[4957]-1013

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

EXAMINATION, 2016

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 ? Calcultate the composite modulus for polyester reinforced with 60 volume % E-glass under isostrain conditions. (Take Young modulus for polyter 6.9GPa and fir glass it is 72.4GPa). [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]

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

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 principal 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 principal, advantages and 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 continous high temperature service under stressed conditions such as jet engine components, gas and steam turbines, neclear reactors and tungsten filaments for electric bulbs.

(*b*) Explain the working priciple 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 teh 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]