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

Seat No.	

[4857]-1013

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

EXAMINATION, 2015

MATERIAL SCIENCE

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

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

(*ii*) Assume suitable data, if necessary.

(*iii*) Neat diagrams should be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

1. (*a*) Show that the atomic packing factor for BCC crystal is 0.68. [4]

(*b*) Explain any two point defects with the help of diagram. [4]

(*c*) A continuous and aligned glass fiber reinforced composite of 40 volume % of glass fibers having a modulus of elasticity of 69 GPa and 60 volume % of a polyester resin that, when hardened, displays a modulus of 3.4 GPa. If the cross-sectional area is 250 mm^2 and a stress of 50 MPa is applied in this longitudinal direction, compute the magnitude of the load carried by each of the fiber and matrix phases. [4]

P.T.O.

Or

2. (*a*) Derive linear density expression of FCC [100] and [111] directions in terms of the atomic radius R. [4]

(*b*) Explain the following processing methods of ceramics : [6]

(*i*) Cold isostatic pressing

(*ii*) Slip casting.

(*c*) Explain work hardening on the basis of dislocations. [2]

3. (*a*) A cylindrical specimen of steel having an original diameter 12.8 mm is tensile tested to fracture and found to have an engineering fracture strength of 460 MPa if its cross-sectional diameter of fracture is 10.7 mm, determine :

(*i*) Ductility in terms of percent reduction in area.

(*ii*) True stress at fracture. [6]

(*b*) What is fatigue ? Draw S-N curve for Mild Steel and Aluminum and explain Endurance limit. [6]

Or

4. (*a*) Explain the methods of magnetization and demagnetization of component during magnetic particle inspection. Why the demagnetization is necessary after testing ? [6]

(*b*) Differentiate between dye penetrant inspection and fluorescent penetrant inspection. [4]

(*c*) Explain Moh's hardness scale. [2]

5. (*a*) Discuss about particle size, shape and size distribution and its effect on the properties of the final sintered compact. [6]

(*b*) Using flow sheet explain manufacturing of cemented carbide tools by powder metallurgy. [7]

Or

6. (*a*) Discuss production of Iron powder by reduction process. [4]

(*b*) What is compaction ? List the defects of compact and their remedies. [5]

(*c*) What is sintering ? Explain the stages of sintering. [4]

7. (*a*) Define nano-material and give application. Write a note on carbon nano-tubes. [6]

(*b*) Give the classification of bio-material. Describe properties and application of Nickel alloy as bio-material. [7]

Or

8. (*a*) Explain the use of Ni base and Cobalt base alloy for high temperature application. [4]

(*b*) Explain the properties of superconductors. Briefly explain any *two* applications of superconductors. [6]

(*c*) Discuss the effect of Cryogenic heat treatment on steel alloy. [3]