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

| **Seat No.** | |
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# [5252]-514

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

**EXAMINATION, 2017**

**MATERIAL SCIENCE**

**(2015 PATTERN)**

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

***N.B.*** :— (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right side indicate full marks.

(*iii*) Use of calculator is allowed.

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

(*v*) Answer Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6**, Q. **7** *or* Q. **8**.

**1.** (*a*) Calculate no. of Atoms per Unit cell for BCC and FCC metal with proper formula. [6]

(*b*) If a metal is forged what difference will be seen in its the following properties and explain why ? [6]

1. Surface finish
2. Dislocation density
3. Internal stresses.

P.T.O.

*Or*

**2.** (*a*) What is polymer and what are the polymeric arrangements in polymer ? Which properties of ceramics makes them different than metal ? [4]

(*b*) Show the following planes on a cubic structures : [4]

(1) (111)

(2) (010)

(*c*) Explain work hardening with respect to dislocation theory in detail. [4]

**3.** (*a*) Suggest the suitable hardness tester for the following applications (any *three*) and justify your answer. [8]

(1) Gray cast iron casting

(2) Hardened steel component

(3) Porous powder metallurgical parts

(4) Hardness of Cr which is plated

(*b*) If two metals should be joined together in assembly which joining method should be preferred to increase its corrosion resistance and explain why ? [5]

*Or*

**4.** (*a*) Suggest different techniques used to increase corrosion resistance of metals. [7]

(*b*) Draw the self explanatory diagram for the following (any *two*) : [6]

(*i*) Stress strain diagram for 0.4% carbon steel

(*ii*) Izode test specimen

(*iii*) X-ray tube used in X-ray radiography

(*iv*) Through transmission Ultrasonic test.

**5.** (*a*) In which surface improvement process it changes its chemical composition on surface ? Explain the process in detail. [6]

(*b*) Draw the self explanatory diagram for the following [6]

(*i*) Electroplating

(*ii*) Powder coating

*Or*

**6.** Suggest the suitable surface coating process for the following applications (and *four*) and give proper justification for the selection. [12]

(*i*) Cr is to coated on handles of door

(*ii*) Slides in park

(*iii*) Semiconductor

(*iv*) Exterior roofs

(*v*) Coating of Titanium nitride on carbide tool

(*vi*) Corrosion protection of aircraft structural steel parts.

**7.** (*a*) Why is it necessary to control furnace atmosphere in sintering ? [4]

(*b*) Explain physical method for manufacturing of powders. [5]

(*c*) Write down the common flow chart used in powder metallurgy. [4]

*Or*

**8.** (*a*) Define the following : [4]

(*i*) Compatibility

(*ii*) Flowability

(*b*) Is liquid phase and solid phase sintering is same ? [3]

(*c*) List important disadvantages and applications of powder metallurgy over other processes. [6]