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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]