

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2064)

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B. Tech 4th Semester Examination

Material Science Engineering (O.S.)

ME-4006

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt one question each from A, B, C and D sections.
Section E is compulsory.

SECTION - A

1. (a) What is Bravais lattice? What is the maximum number of Bravais lattices possible? Explain along with diagram. (10)
- (b) A F.C.C. unit cell has a lattice constant $a=4.0 \times 10^{-10}$ m. Calculate the number of atoms per unit area on (110) & (111) planes and density of atoms per unit length in directions (110) & (111). (10)
2. (a) Explain with neat sketch the difference between edge and screw dislocations. Also discuss about other possible dislocations. (10)
- (b) Discuss in detail the different defects in metal crystals. How these defects affect the metal properties? (10)

SECTION - B

3. (a) Explain the working and importance of TTT diagram. What information is supplied by these? Discuss in detail. (10)

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- (b) What are different heat treatment processes? Discuss principles, purpose and classification of hardening, carburizing and annealing processes. (10)
4. (a) Explain importance and objective of phase diagrams. Draw Fe-C phase diagram. Label all the phases and temperatures properly. (10)
- (b) Discuss allotropic transformation of Iron & Steel. Also discuss properties of Austenite, ferrite, pearlite and martensite. (10)

SECTION - C

5. (a) Discuss mechanism of plastic deformation in detail. What is yield point phenomenon? (10)
- (b) What is Bauschinger effect? Explain strain hardening, recovery and grain growth. (10)
6. (a) Discuss the process of slip. How deformation takes place in slip? What are slip systems and easy slip directions? (10)
- (b) Explain in detail, properties of nickel, vanadium and cobalt & their effect of adding in alloy steel. (10)

SECTION - D

7. (a) What is creep? Draw the typical curve and explain the three stages of creep. (10)
- (b) What are the fatigue limit and fatigue strength? Discuss in detail the fatigue failure of metals. (10)
8. (a) Explain in detail, corrosion & different types along with suitable diagrams. (10)
- (b) Explain creep testing and prevention against creep in detail. And also prevention against corrosion. (10)

SECTION - E

9. (a) Why equilibrium phase diagrams are preferred?
- (b) What is the significance of 'Level Rule'?
- (c) Define Gibb's phase rule.
- (d) What are solid solutions?
- (e) What is cyaniding and nitriding?
- (f) What is a quenching process?
- (g) Define atomic packing factor.
- (h) What is difference between crystalline and non-crystalline solids?
- (i) What are peritectic and peritectoid systems?
- (j) Explain S-N curve. (10×2=20)