Total No. of Questions : 10]

SEAT No. :

P4003

[Total No. of Pages : 2

[4860] - 97

M.E. (Mechanical) (Design Engineering)

ADVANCED MATERIAL SCIENCE

(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) *Answer any 03 questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) List important micro-constituents of Fe-C system and Explain their mechanical properties. Draw neat Fe-C Diagram showing all details. **[8]**

b) What is co-ordination number? How it is useful to decide lattice structure? What is physical significance in metallic structure? **[8]**

Q2) a) Explain the various methods to achieve high strength in HSLA steels. **[8]**

b) Explain the method used for hardening non ferrous alloys. **[8]**

Q3) a) What do you mean by Atomic packing factor? Explain the packing of atoms to form simple cubic, Body centered Cubic, FCC and HCP. **[8]**

b) List and sketch five possible Bravais lattices in two dimensions. What is Schottky and Frenkel defect? **[8]**

Q4) a) Explain the age hardening with the help of typical equilibrium diagram? How it is achieved in non ferrous materials? **[8]**

b) Explain spheroidizing annealing process used in heat treatment of tool steel. **[8]**

P.T.O.

Q5) Write a note on following (Any Three) : **[18]**

a) Cu-Al alloys

b) Dual phased steel

c) Creep resistant materials

d) Inconels and Haste alloys.

SECTION - II

Q6) a) Discuss mechanical, chemical, physical and biological requirements of orthopedic biomaterials.? **[8]**

b) What is super conducting materials? How they are produced? What are its applications. **[8]**

Q7) a) Explain how the volume of the fibre, fiber orientation and fiber strength are related to each other? **[8]**

b) Determine the use of cermets in cutting tools for machining. **[8]**

Q8) a) Explain IVD ion implantation method. **[8]**

b) Explain vacuum based coating methods to reduce the friction. **[8]**

Q9) a) Explain the meaning of the following terms : **[8]**

Ceramics, inorganic glass, glass-ceramics, cermets. Explain why ceramics typically are processed as powders. How is this similar or different from the processing of metals? **[8]**

b) What is PVD? Explain the process in detail mentioning its advantages, limitations, and applications. **[8]**

Q10) Write a note on (Any Three) : **[18]**

a) Shape Memory Alloys.

b) Prosthetic materials.

c) Sports materials.

d) CVD.

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