C 48861 (Pages 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2008

ME/AM 04 404—METALLURGY AND MATERIAL SCIENCE

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

I. 1 Name the type of structure and sketch the unit cells of the following metals :—

Iron, Copper, Aluminium, Magnesium.

2 Explain the following :—

(a) Mechanical properties.

(b) Magnetic properties.

(c) Optical properties.

3 How the atoms are held together in a metallic-bond ? Explain this diagrammatically.

4 Distinguish between 'Plastic deformation' and 'fracture'.

5 Differentiate between 'annealing' and 'normalizing'.

6 Draw the thermal-equilibrium diagram for two metals that show complete liquid and solid solubility.

7 Write short notes on 'Nano materials'.

8 Name different types of Al Alloys and briefly discuss any two of them.

(8 × 5 = 40 marks)

II. 1 Explain the steps involved in the preparation of specimen for metallographic examination. (15 marks)

Or

2 (a) Explain the working principle of an electron microscope. (7 marks)

(b) What is meant by atomic packing factor ? How it is calculated for BCC and FCC structure ? (8 marks)

III. 1 Explain the effect of 'recovery' 'recrystallisation' and 'grain growth' on 'hardness' and 'electrical resistance' properties of a cold-worked metal on its subsequent annealing. (15 marks)

Or

Turn over

2 (a) Explain the concept of strain hardening with the help of dislocations. (7 marks)

(b) Distinguish between 'Slip' and 'twinning' as modes of plastic deformation of metal and alloys.

(8 marks)

IV. 1 (a) Distinguish between hardness and hardenability of steels with examples. Discuss the various factors on which hardenability depends.

(8 marks)

(b) Discuss with a neat diagram the difference between martempering and austempering in their operation, structure and advantages.

(7 marks)

Or

2 (a) Explain the principles of construction of T.T.T. diagrams and discuss the effect of various cooling rates on the transformation in an eutectoid steel using isothermal transformation diagram.

(10 marks)

(b) Briefly explain with an example why in certain alloy system, precipitation hardening is more effective.

(5 marks)

V. 1 (a) Differentiate between white cast iron and white heart malleable cast iron. Describe the process by which one may be made into the other.

(10 marks)

(b) How are alloying elements effective in changing the properties of steel. (5 marks)

Or

2 (a) Give an concise account of the nature of alloys. (7 marks)

(b) Mention the properties of pure Al. (8 marks)

[4 × 15 = 60 marks)