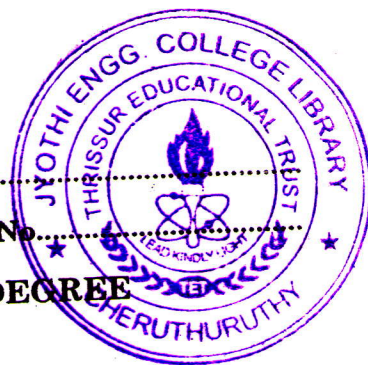


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Name.....

Reg. No.....



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

**ME/AM 04 404—METALLURGY AND MATERIAL SCIENCE**

(2004 Admissions)

**Maximum : 100 Marks**

**Time : Three Hours**

- 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]