D 70376   (Pages : 2)   Name.....................

                                                              Reg. No.................

THIRD SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2014

AN/ME/AM/MT 09 306/PTME 09 305—METALLURGY AND MATERIALS SCIENCE

Time : Three Hours   Maximum : 70 Marks

Part A

Answer all questions.
Each question carries 2 marks.

1. What is the difference between atomic structure and crystal structure ?

2. What is meant by allotropy ?

3. State the effect of imperfections on metal properties.

4. Define hardenability.

5. Write the limitations of ferrous alloys.

$(5 \times 2 = 10 \text{ marks})$

Part B

*Answer any **four** questions.*
Each question carries 5 marks.

6. Explain how crystal structure is determined by X-ray diffraction.

7. Discuss about microscopic examination of crystal structure.

8. Derive an expression for the critical resolved shear stress.

9. Differentiate between ductile and brittle fracture.

10. Compare austempering and martempering.

11. Explain the properties and applications of super alloys.

$(4 \times 5 = 20 \text{ marks})$

Part C

Answer all questions.
Each question carries 10 marks.

12. (a) Enumerate the various types of bonds occurring in crystals and describe briefly the characteristics of the metallic bond.

Or

(b) Describe with neat sketches the arrangement of atoms in the BCC, FCC and HCP lattices. Show that a FCC structure is always more close packed than a FCC structure.

Turn over

13. (a) Give brief account of the following :—

    (i) Point defects. (5 marks)

    (ii) Line defects. (5 marks)

Or

(b) Explain the following :—

    (i) Creep curve. (5 marks)

    (ii) Work hardening. (5 marks)

14. (a) Draw the equilibrium diagram of iron-carbon system and discuss transformations that take place from melting point to room temperature at any percentage of carbon.

Or

(b) Draw and explain Pb-Sn phase diagram.

15. (a) Describe composition, properties and applications of any five copper alloys.

Or

(b) Write short notes on the following :—

    (i) Stainless steels. (5 marks)

    (ii) Shape memory alloys. (5 marks)

$[4 \times 10 = 40$ marks]