Reg. No. : | | | | | | | | | | | |

# R 3481

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Fourth Semester

(Regulation 2004)

Mechanical Engineering

MH 1151 — ENGINEERING MATERIALS AND METALLURGY

(Common to Automobile Engineering, Production Engineering)

(Common to B.E. (Part-Time) Third Semester Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is substitutional solid solution? Give two examples.

2. Give an example of eutectoid reaction.

3. Define critical cooling rate.

4. Can mild steel be induction hardened? Substantiate.

5. List different types of tool steels.

6. Mention any two aluminium base alloys and their applications.

7. Name any four common engineering polymers.

8. Name the phases present in alpha aluminium oxide.

9. How may one distinguish between slip and twinning if the width of the twin band is of the same order as a slip line?

10. Why are impact specimens notched?

PART B — ($5 \times 16 = 80$ marks)

11. (a) Metals A and B having melting points respectively 270°C and 320°C are assumed to be completely soluble in the liquid state and completely insoluble in solid state. They form eutectic at 140 °C containing 40% B.

(i) Draw the equilibrium diagram and label all lines and areas and (8)

(ii) For an alloy containing 30% A give the temperature of initial and final solidification and relative amounts of phases present at 180°C. (8)

Or

(b) With the help of the Fe-C equilibrium diagram describe completely the changes that take place during the slow cooling of a 0.5% carbon steel from liquid state.

12. (a) (i) With the help of a TTT diagram explain the following heat treatments applied to an eutectoid steel :

Austempering, Martempering and Hardening. (12)

(ii) What is Spheroidize annealing process? State its applications. (4)

Or

(b) (i) What is meant by hardenability? Describe a method of measuring hardenability of alloy steel. (10)

(ii) Distinguish between diffusion and thermal surface hardening treatments. (6)

13. (a) (i) What are stainless steels? What are the main characteristics of stainless steels? Name different types of stainless steels and their main applications. (12)

(ii) What are HSLA steels? How can high strength and toughness be obtained in them? (4)

Or

(b) (i) Describe the properties and applications of the following Cu-Zn brasses : Cartridge brass, Naval brass and Muntz metal. (8)

(ii) Explain precipitation strengthening treatment with a suitable example. (8)

14. (a) (i) Compare and contrast the difference between polypropylene and polyethylene. (8)

(ii) Compare the differences between :

(1) Acrylonitrile butadiene styrene and polystyrene and

(2) PVC and PTFE. (8)

Or

(b) (i) Discuss the properties and applications of Partially stabilized zirconia and Sialon. (8)

(ii) Describe different types of reinforcement used in polymer composites. (8)

15. (a) (i) Explain the mechanism of plastic deformation of metals by slip. (8)

(ii) With the help of neat sketches explain the difference between brittle and ductile fracture. (8)

Or

(b) (i) Draw S-N curve for mild steel and Aluminium and explain its features. Explain the procedure used to obtain S-N diagram. (11)

(ii) What are salient features of Rockwell hardness test? What are the precautions to be taken while determining hardness by this method? (5)