**Registration No:** | | | | | | | | | | |

**Total Number of Pages: 02** **B.TECH**

**PME3I001**

# 3rd Semester Regular Examination 2016-17

## INTRODUCTION TO PHYSICAL METALLURGY & ENGINEERING MATERIALS

**BRANCH: MECH**

**Time: 3 Hours**

**Max Marks: 100**

**Q.CODE: Y591**

**Answer Part-A which is compulsory and any four from Part-B.**

**The figures in the right hand margin indicate marks.**

**Part – A (Answer all the questions)**

**Q1** **Answer the following questions: *multiple type or dash fill up type*** **(2 x 10)**

**a)** Which is closest to the purest form of the iron?
(A) Cast Iron (B) Wrought Iron (C) Pig Iron (D) Steel

**b)** Eutectic reaction for iron- carbon system occurs at
(A) 600° C (B) 723° C (C) 1147° C (D) 1490° C

**c)** The crystal structure of α iron is
(A) Simple Cubic (B) Face centered cubic(C) Body centered cubic
(D) Close packed hexagonal

**d)** Thermoplastic materials are those materials which
(A) are formed into shape under heat and pressure and results in a permanently hard product
(B) do not become hard with the application of heat and pressure and no chemical change occurs
(C) are flexible and can withstand considerable wear under suitable conditions
(D) are used as a friction lining for clutches and brakes

**e)** Which of the following material has maximum ductility?
(A) Mild steel (B) Copper (C) Nickel (D) Aluminium

**f)** An eutectoid steel consists of
(A) wholly pearlite (B) wholly austenite (C) pearlite and ferrite
(D) pearlite and cementite

**g)** Metal with hexagonal close packed structure is
(A) silver (B) Iron (C) Magnesium (D) Aluminium

**h)** Eutectoid product in Fe-C system is called
(A) Pearlite (B) Bainite (C) Ledeburite (D) Spheroidite

**i)** Stainless steel is so called because of its _____.

**j)** The percentage of carbon in gray cast iron is in the range of_____.

**Q2** **Answer the following questions: *Short answer type*** **(2 x 10)**

**a)** What do you mean by advanced material?

**b)** Briefly write down the function of alloying elements in tool steel?

**c)** What is the difference between hardness and hardenability?
**d)** Define preferred orientation in polycrystalline materials.
**e)** What is toughness? Show it graphically.
**f)** What is Griffith's criterion? Explain.
**g)** Distinguish between austempering and martempering.
**h)** What is the purpose of tempering quenched steel?
**i)** Show that for a face centered cubic crystal packing fraction is 74%.
**j)** What is a solid solution? Give the classification and explain the rules for the formation of solid solutions.

## Part – B (Answer any four questions)

**Q3** **a)** Draw binary eutectic phase diagram of any two phase component system and show the salient points. **(10)**

**b)** Describe the FCC, BCC and hexagonal close-packed metallic crystal structure in detail with sketch. **(5)**

**Q4** **a)** What influence does the presence of alloying elements (other than carbon) have on the shape of a hardenability curve? Briefly explain this effect. **(10)**

**b)** Define slip system. Do all metals have the slip system? Justify your answer. **(5)**

**Q5** **a)** What is equilibrium diagram? What information is obtained from it? **(10)**

**b)** What is cooling curve? Draw cooling curve for (I) pure metal (II) alloy **(5)**

**Q6** **a)** What is recrystallization? What are the factors affecting recrystallization temperature? **(10)**

**b)** What are the types of bonding? Explain them in detail. **(5)**

**Q7** **a)** Explain in detail different methods used for strengthening metals against yield. (10)

**b)** What do you mean by composite material? Explain briefly. **(5)**

**Q8** **a)** Sketch an unit cell and show the following planes (a) (112) (b) (101) (c) $\bar{1}11$ (d) (123). **(10)**

**b)** Distinguish between austempering and martempering. **(5)**

**Q9** **a)** What are the possible alloy structures. Explain briefly the different alloy structures with suitable examples. **(10)**

**b)** Distinguish between steels and cast irons and highlight the importance of each of them as engineering materials. **(5)**