Code No: NR220302 **NR**

II B.Tech II Semester Supplementary Examinations, November/December 2005
METALLURGY AND MATERIAL SCIENCE
(Common to Mechanical Engineering, Mechatronics and Production Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Draw the close packed planes and directions in simple cube, BCC and FCC crystals and find out the Miller indices of the planes. [8]
   (b) Explain briefly about the various types of crystal imperfections, with the help of neat sketches. [8]
2. (a) What is allotrophy? Explain with suitable examples? [6]
   (b) Distinguish between crystal structure microstructure and macrostructure give examples. [10]
3. (a) Draw a neat sketch of $Fe-Fe_3C$ diagram and label all important points, lines and phases in it. [10]
   (b) Explain the solidification of hypo eutectic cast Iron. [6]
4. (a) Explain the Malleabilizing treatment given to white iron castings. Sketch the typical microstructure of malleable cast iron. Label the phases in it. [8]
   (b) What is High speed steel? Give the typical composition of High speed steel. Explain the part played by each of the alloying elements in tool steels. Explain the heat treatment process of High speed steel. [8]
5. (a) Explain the differences among the following: [3x3=9]
      i. coherent
      ii. partially coherent
      iii. incoherent
      interfaces.
      Also explain how interfacial energy vary with coherency.
   (b) Distinguish between Martensite and Bainitic transformations. [7]
6. Explain the following with respect to structure, composition; properties and applications of [4x4=16]
   (a) Alpha Brass
   (b) Silicon Bronze
   (c) Duralumin
   (d) Cartridge Brass.

7. (a) Define a ceramic material. What are some properties common to most ceramic materials? [4]
   (b) Distinguish between traditional and engineering ceramic materials and give examples of each. [6]
   (c) What are the basic steps in the processing of ceramic products by the agglomeration of particles? Explain. [6]

8. (a) What is MMC? Where are they used? Classify the MMCs according to the type of reinforcement. [7]
   (b) Discuss about the following with relevant examples and applications: [3]
      i. Continuous- fiber reinforced MMCs. [3]
      ii. Discontinuous- fiber reinforced MMCs.
      iii. Particulate reinforced MMCs. [3]

⋆ ⋆ ⋆ ⋆ ⋆