Code No: NR220805 **NR**

II B.Tech II Semester Supplementary Examinations, November/December 2005
MATERIAL SCIENCE FOR CHEMICAL ENGINEERING
(Chemical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. What are advanced materials? How advanced materials are developed through combination of conventional engineering materials? [16]

2. (a) What electron subshell is being filled for the rare earth series of elements on the periodic table?
   (b) What electronic subshell is being filled for the actinide series? [8+8]

3. (a) Make a plot of the melting points and boiling points of materials of different bonding characteristics as a function of their bond length.
   (b) Explain why the increasing trend of melting and boiling points show a reversal after silicon, even though the bond energy continues to increase. [8+8]

4. (a) Explain the construction of phase diagram for brass.
   (b) Explain the applications of phase diagrams with special reference to manufacture of steels. [8+8]

5. (a) Steady state creep rate of an alloy under an applied stress of 25 Mpa at 6200C is $3.1 \times 10^{-12} s^{-1}$. A component made from this alloy is subjected to a stress of 25Mpa at $620^0 C$ for 60% of the running time and to 30 Mpa at $650^0 C$ for 40% of the running time. Steady state creep rate of the ally is given by: $d\varepsilon/dt = A\sigma^5 e^{-Q/RT}$ where Q=160KJ/mol. Calculate the average creep rate of the component.
   (b) Name four strengthening mechanisms.
   (c) Sketch and label a typical creep curve. Identify the normally used design parameter from the above curve. [16]

6. (a) Define the parabolic law of oxidation.
   (b) What are the common alloying elements added to steel for improving oxidation.
   (c) Briefly discuss about the oxidation resistant Materials. [5+5+6]

7. Solids are classified as metals, Semiconductors and insulators according their band structure. Explain in detail with diagrams. [16]

8. Write short notes on the following:
   (a) High frequency applications of ferrites

(b) Eddy Current losses in ferromagnetic materials [8+8]

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