MINOR II

EPL 337- MATERIALS SCIENCE & ENGINEERING

21st March 2015

Answer **all** questions | Time **One** Hour | Maximum Marks **25**

Q.1. A binary alloy is cooled from near its melting temperature at different rates of cooling. What are the possible mechanisms by which different structural transformations take place? (3)

Q.2. A Fe-C system is cooled from ~ 900 C to different temperatures and held there for transformation to complete.

a) What are the possible structural morphologies observed? (3)

(b) What is the effect of cooling rate on these structural features? (2)

Q.3. **Differentiate** between:

(a) Spinodal decomposition versus Normal precipitation (3)

(b) Massive transformation versus Martensitic transformation (3)

Q.4. (a) **What** are the factors and **how** they affect the resistivity (electrical) of a conductor? (3)

(b) Resistivity of Au-Cu alloy system, of different compositions, is measured at different temperatures. How does the resistivity of such a system change if the system undergoes a phase transformation from a disordered state to an ordered state? Give reasons. (2)

Q.5. In an experiment radioactive nickel was diffused into the surface of iron for 25 minutes at 1200 C and radioactivity was detected at a depth of 1.5 mm beneath the surface. A companion sample was heated for 60 minutes at 1000 C. **At what depth** radioactivity will be detected in the companion sample?

(Given $D_0 = 0.77 \times 10^{-4}$ m^2/sec. , $E_{diff} = 67000$ cal/mole, $k_B = 1.987$ cal/mole K) (6)