B.E. Met & Mat Engg 6th Semester Examination, 2010

Materials Characterization

(MT 602)

Time3hrs **Full Marks 70**

(Answer any SEVEN questions)

Q1. (a) What is Auger effect? Explain how this effect is used in Auger electron spectroscopy to study the lateral elemental distribution of very thin sample surfaces.

(b) State the advantages and limitations of AES as a surface analytical tool.

(6+4)

Q2. (a) Explain what is meant by integral breadth of an x-ray diffraction profile.

(b) Describe how grain size and lattice strain can be determined graphically by using the values of integral breadth.

(3+7)

Q3.(a) Define the following (i) Bohr magneton, (ii) curie temperature, (iii) exchange interactions, (iv) Bloch wall

(b) State and explain the factors that affect the properties of a crystalline magnetic material.

(6+4)

Q4. (a) State Mattheissen rule and explain its importance from the viewpoint of characterizing metals and alloys

(b) State some applications of resistivity measurement as a means for studying the properties of metals and alloys.

(6+4)

Q5. (a) Explain the working principle of DTA-TGA.

(b) What are the limitations of DTA in quantitative analysis? State measures to overcome the limitations.

(5+5)

Q6. (a) Explain the working principle of a polarized ray microscope?

(b) Name the application areas where polarized ray microscope can provide useful information's compared to the ordinary light ray microscope.

(5+5)

Q7. (a) What is meant by resolution of a microscope? With the help of a schematic explain how the resolution is improved in 'a near field scanning optical microscope (NSOM).

(b) State the advantages of interference microscopy over ordinary light microscope

(7+3)

Q8. (a) Name the type of signals used in scanning electron microscope to form image of the surface topography and provide information's on the composition of observed microstructural features,

(b) Explain the advantages of using different signals in SEM for analyzing the microstructural features.

Q9. (a) Differentiate between a dark field and bright field image in TEM.

(b) Briefly describe how a metallic sample is prepared for TEM investigations.

(c) What is staining? Why it is done in some samples for TEM studies? Name some commonly used staining agents

(2+5+3)

Q10. (a) Name the different modes of operation of an atomic force microscope.

(b) State and compare the advantages and limitations of the AFM images recorded under different operating modes.

(2+8)