

IV B.Tech I Semester Regular Examinations, November 2005
EXPERIMENTAL TECHNIQUES IN METALLOGRAPHY
(Metallurgy & Material Technology)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain electrochemical polishing diagrammatically.
(b) Draw a rough plot of current density Vs voltage, showing different regions during polishing. [10+6]
2. (a) What is the difference between normal etching and thermal etching?
(b) How the specimens are thermally etched?
(c) Give few examples for thermally etched specimens. [6+8+2]
3. (a) Explain optical anisotropy in detail.
(b) Explain schematically how the optical anisotropy is produced by etching. [8+8]
4. (a) How the optical microscope eyepieces are grouped? Explain one of them in detail.
(b) Explain negative eyepieces in detail. Give an example for negative eyepiece. [8+8]
5. What are different components of an optical microscope? Describe them in detail. [16]
6. (a) What do you mean by orientation contrast? How it comes in the electron microscopy?
(b) How displacement fringe contrast arises? Explain in detail. [9+7]
7. (a) What are the uses and advantages of dark-field images?
(b) Explain the calibration techniques of electron microscopy. [8+8]
8. (a) What do you mean by one sided thinning? Explain.
(b) When the samples are one side thinned? Explain.
(c) Explain the electron microscopy of one side thinned samples. [4+6+6]

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1. (a) Explain various regions in the plot, current density Vs voltage.
(b) Explain various electrolytes and their compositions used for polishing. [8+8]
2. (a) How does the disturbed metal form during polishing operation.
(b) How the disturbed metal is removed?
(c) What is the effect of etchant on grain boundaries? [4+4+8]
3. (a) Define reflectivity.
(b) How the reflectivity of various phases changes in a specimen after etching? [4+12]
4. (a) Define angular aperture. What is its significance in optical microscopy?
(b) Compare and contrast bright field illumination and Dark field illumination. [8+8]
5. (a) What are measuring and Reticle type eyepieces?
(b) When the measuring and Reticle type eyepieces are used? How they function? [5+11]
6. (a) Describe the construction of electron microscope in detail.
(b) Describe the functioning of electron microscope in detail. [8+8]
7. (a) What are the uses and advantages of dark-field images?
(b) Explain the calibration techniques of electron microscopy. [8+8]
8. (a) Describe in detail etched transmission samples. [6]
(b) i. What is the necessity of surface decoration?
ii. Explain in detail surface decoration techniques. [4+6]

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1. (a) Explain electrochemical polishing diagrammatically.
(b) Draw a rough plot of current density Vs voltage, showing different regions during polishing. [10+6]
2. (a) Explain the sample preparation of polycrystalline films and single crystal films.
(b) Explain the deposition of specimens from [8+8]
 - i. Liquid phase
 - ii. Solution
3. (a) Define reflectivity.
(b) How the reflectivity of various phases changes in a specimen after etching? [4+12]
4. Explain in detail optical microscope objectives and eyepieces. [16]
5. What are different components of an optical microscope? Describe them in detail. [16]
6. (a) What is the role of condenser coil in the electron microscopy? Discuss in detail.
(b) What is the role of magnetic coils in the electron microscope? Discuss in detail. [8+8]
7. (a) What are the uses and advantages of dark-field images?
(b) Explain the calibration techniques of electron microscopy. [8+8]
8. (a) Explain the dynamic theory of contrast in detail.
(b) Explain the Kinematical theory of diffraction. [8+8]

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1. (a) For which metals, electrolytic polishing is usually employed? Why?
(b) What is the principle behind electrolytic polishing? Explain. [4+12]
2. (a) What is heat tinting? How the heat tinting is carried out?
(b) Explain in detail Relief Polishing and etching. [16]
3. (a) Explain optical anisotropy in detail.
(b) Explain schematically how the optical anisotropy is produced by etching. [8+8]
4. Explain schematically the ray diagram and the principle of optical metallurgical compound microscope. [16]
5. (a) Explain the design and functioning of a table-type microscope in detail.
(b) Explain the history of illuminating sources. [9+7]
6. (a) Describe the construction of electron microscope in detail.
(b) Describe the functioning of electron microscope in detail. [8+8]
7. (a) Explain the mechanism of diffraction contrast schematically.
(b) How does selected area diffraction differ from the usual technique employed in electron diffraction cameras? Explain how accuracy of selected area diffraction is achieved. [6+10]
8. (a) Derive an expression for the transmitted intensity from perfect crystal.
(b) Describe in detail special transmission techniques. [8+8]
