

Model Question Paper-1

USN

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Fifth Semester B.E. Degree Examination Characterization Techniques

TIME: 03 Hours

Max. Marks: 100

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

| Module – 1 | | | |
|-------------------|-----|--|-----------|
| Q.1 | (a) | Explain in detailedly about Rayleigh criterion and Abbe criterion. | 8 |
| | (b) | Mention the different structural characterization tools & explain any two briefly. | 12 |
| OR | | | |
| Q.2 | (a) | Mention the different compositional characterization tools & explain any two briefly. | 12 |
| | (b) | Explain the electron diffraction & interference detailedly with suitable diagram. | 8 |
| Module – 2 | | | |
| Q.3 | (a) | Explain the working of XPS detailedly along with neat schematic. | 8 |
| | (b) | Explain the working of single crystalline XRD detailedly along with neat schematic. | 8 |
| | (c) | Write a short note on EXAFS. | 4 |
| OR | | | |
| Q.4 | (a) | Explain the working of powder XRD detailedly along with neat schematic. | 8 |
| | (b) | Mention the advantages, disadvantages & explain basic principle of powder XRD. | 8 |
| | (c) | Write a short note on XANES. | 4 |
| Module – 3 | | | |
| Q.5 | (a) | With a neat schematic diagram explain the working of Scanning Electron Microscope along with its advantages. | 10 |

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|-------------------|-----|--|----|
| | (b) | With a neat schematic diagram explain the working of Transmission Electron Microscope (TEM) along with its advantages. | 10 |
| OR | | | |
| Q.6 | (a) | Mention & briefly explain the different operating modes of Atomic Force Microscope (AFM). | 10 |
| | (b) | Write a short note on Electron beam interaction with matter & Selective Area Electron Diffraction (SAED). | 10 |
| Module – 4 | | | |
| Q.7 | (a) | Define Zeta potential. Explain the process of measuring zeta potential & application of zeta potential. | 10 |
| | (b) | Explain dynamic light scattering method along with neat schematic for nanoparticle size measurement. | 10 |
| OR | | | |
| Q.8 | (a) | Explain the working of FTIR spectrometer along with a neat schematic. | 10 |
| | (b) | Explain the working of UV-Vis spectrometer along with a neat schematic. | 10 |
| Module – 5 | | | |
| Q.9 | (a) | Explain the DC reversal measurement circuit using a four-wire lead arrangement for nanotech & other sensitive devices. | 10 |
| | (b) | Detailedly explain lock in amplifier method to measure AC signals for low power nanotech & other sensing devices. | 10 |
| OR | | | |
| Q.10 | (a) | Explain impedance measurement & analysis using LCR meter detailedly along with neat schematic. | 10 |
| | (b) | Explain the detailed procedure along with schematic for obtaining IV curve of a sample with single point on the surface. | 10 |

| Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome | | | | |
|--|---------------------------------------|--|--|--------|
| Question | Bloom's Taxonomy Level attached | Course Outcome | Programme Outcome | |
| Q.1 | (a) | L ₁ , L ₂ , L ₃ | 1 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 1 | 1,2,12 |
| Q.2 | (a) | L ₁ , L ₂ , L ₃ | 1 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 1 | 1,2,12 |
| Q.3 | (a) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| | (c) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| Q.4 | (a) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| | (c) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| Q.5 | (a) | L ₁ , L ₂ , L ₃ | 3 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 3 | 1,2,12 |
| Q.6 | (a) | L ₁ , L ₂ , L ₃ | 3 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 3 | 1,2,12 |
| Q.7 | (a) | L ₁ , L ₂ , L ₃ | 4 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 4 | 1,2,12 |
| Q.8 | (a) | L ₁ , L ₂ , L ₃ | 4 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 4 | 1,2,12 |
| Q.9 | (a) | L ₁ , L ₂ , L ₃ | 5 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 5 | 1,2,12 |
| Q.10 | (a) | L ₁ , L ₂ , L ₃ | 5 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 5 | 1,2,12 |
| Bloom's Taxonomy Levels | Lower order thinking skills | | | |
| | Remembering(knowledge):L ₁ | Understanding Comprehension): L ₂ | Applying (Application): L ₃ | |
| | Higher order thinking skills | | | |
| | Analyzing (Analysis): L ₄ | Valuating (Evaluation): L ₅ | Creating (Synthesis): L ₆ | |



Model Question Paper-2

USN

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Fifth Semester B.E. Degree Examination Characterization Techniques

TIME: 03 Hours

Max. Marks: 100

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

| Module – 1 | | | |
|-------------------|-----|--|-----------|
| Q.1 | (a) | Explain the different types of characterization techniques briefly. | 10 |
| | (b) | Write a short note on: a) Types of detectors b) importance of characterization. | 10 |
| OR | | | |
| Q.2 | | Write a short note on: a) Electron lenses b) Scan coils c) Different types of sources d) Lens aberrations | 20 |
| Module – 2 | | | |
| Q.3 | (a) | Mention the advantages, disadvantages & explain basic principle of single crystalline XRD. | 10 |
| | (b) | Explain the working of single crystalline XRD detailedly along with neat schematic. | 10 |
| OR | | | |
| Q.4 | (a) | Explain the working of powder XRD detailedly along with neat schematic. | 10 |
| | (b) | Mention the advantages, disadvantages & explain basic principle of XPS. | 10 |
| Module – 3 | | | |
| Q.5 | (a) | Mention & briefly explain the different operating modes of Atomic Force Microscope (AFM). | 10 |

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|-------------------|-----|---|----|
| | (b) | Briefly explain the working of Scanning Tunneling Microscope (STM) along with a neat schematic. | 10 |
| OR | | | |
| Q.6 | (a) | Briefly explain the working of Atomic Force Microscope (AFM) along with a neat schematic. | 10 |
| | (b) | With a neat schematic diagram explain the working of Transmission Electron Microscope (TEM) detailedly. | 10 |
| Module – 4 | | | |
| Q.7 | (a) | Explain the working of UV-Vis spectrometer along with a neat schematic. | 10 |
| | (b) | Explain the working of Raman spectroscopy along with a neat schematic. | 10 |
| OR | | | |
| Q.8 | (a) | Explain the principles, advantages & disadvantages of UV-Vis spectrometer. | 10 |
| | (b) | Explain the working of FTIR spectrometer along with a neat schematic. | 10 |
| Module – 5 | | | |
| Q.9 | (a) | Define potentiometry? Explain the working principle of potentiometry with a neat schematical diagram. | 10 |
| | (b) | Explain the detailed working process of linear sweep voltammetry. | 10 |
| OR | | | |
| Q.10 | (a) | Explain the detailed working process of cyclic voltammetry. | 10 |
| | (b) | Explain impedance measurement & analysis using LCR meter detailedly along with neat schematic. | 10 |

| Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome | | | | |
|--|--|--|--|--------|
| Question | Bloom's Taxonomy Level attached | Course Outcome | Programme Outcome | |
| Q.1 | (a) | L ₁ , L ₂ , L ₃ | 1 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 1 | 1,2,12 |
| | (c) | L ₁ , L ₂ , L ₃ | 1 | 1,2,12 |
| Q.2 | | L ₁ , L ₂ , L ₃ | 1 | 1,2,12 |
| Q.3 | (a) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| | (c) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| Q.4 | (a) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| | (c) | L ₁ , L ₂ , L ₃ | 2 | 1,2,12 |
| Q.5 | (a) | L ₁ , L ₂ , L ₃ | 3 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 3 | 1,2,12 |
| Q.6 | (a) | L ₁ , L ₂ , L ₃ | 3 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 3 | 1,2,12 |
| Q.7 | (a) | L ₁ , L ₂ , L ₃ | 4 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 4 | 1,2,12 |
| Q.8 | (a) | L ₁ , L ₂ , L ₃ | 4 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 4 | 1,2,12 |
| Q.9 | (a) | L ₁ , L ₂ , L ₃ | 5 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 5 | 1,2,12 |
| Q.10 | (a) | L ₁ , L ₂ , L ₃ | 5 | 1,2,12 |
| | (b) | L ₁ , L ₂ , L ₃ | 5 | 1,2,12 |
| Bloom's Taxonomy Levels | Lower order thinking skills | | | |
| | Remembering(knowledge):L ₁ | Understanding Comprehension): L ₂ | Applying (Application): L ₃ | |
| | Higher order thinking skills | | | |
| | Analyzing (Analysis): L ₄ | Valuating (Evaluation): L ₅ | Creating (Synthesis): L ₆ | |

