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Question Paper Code	12296
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023**

Sixth Semester

**Production Engineering**

**20MEEL612 - MATERIALS CHARACTERIZATION**

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

- |   | <i>Marks,<br/>K-Level, CO</i> |
|---|-------------------------------|
| 1. What is optical metallography?   | <i>2,K1,CO1</i>               |
| 2. Define depth of focus in microscopy.                                     | <i>2,K1,CO1</i>               |
| 3. Explain the term reciprocal lattice.                                     | <i>2,K2,CO2</i>               |
| 4. What are absorption edges in X-ray spectroscopy?                         | <i>2,K1,CO2</i>               |
| 5. Define residual stress in the context of X-ray diffraction.              | <i>2,K1,CO3</i>               |
| 6. What are lattice parameters in crystal structure determination?          | <i>2,K1,CO3</i>               |
| 7. Explain the role of the electron beam in SEM imaging.                    | <i>2,K2,CO4</i>               |
| 8. How is the depth of field controlled in SEM imaging?                     | <i>2,K1,CO4</i>               |
| 9. What is Electron Spectroscopy for Chemical Analysis (ESCA)?              | <i>2,K1,CO5</i>               |
| 10. Describe the principle of Ultraviolet Photoelectron Spectroscopy (UPS). | <i>2,K2,CO5</i>               |

**PART - B (5 × 16 = 80 Marks)**

Answer ALL Questions

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| 11. Explain the basic principles of an optical microscope, including the roles of the objective lens, eyepiece lens, and light source.                           | <i>16,K2,CO1</i> |
| 12. Describe the illumination techniques used in optical microscopy and their advantages and limitations.  | <i>16,K2,CO1</i> |
| 13. Discuss the operation and characteristics of a Geiger counter used in X-ray detection.   | <i>16,K2,CO2</i> |
| 14. Explain the advantages and disadvantages of semiconductor-based X-ray detectors.   | <i>16,K2,CO2</i> |
| 15. Explain the concept of line broadening in X-ray diffraction and how it can be used to determine the crystallite size of a material.                          | <i>16,K2,CO3</i> |
| 16. Explain the concept of indexing in crystal structure determination. Also explain, how does indexing help in determining the crystal structure of a material? | <i>16,K2,CO3</i> |
| 17. Explain how secondary electrons and backscattered electrons are detected and used to form an image in SEM.   | <i>16,K2,CO4</i> |
| 18. Compare and contrast Energy Dispersive Spectroscopy (EDS) and Wave Dispersive Spectroscopy (WDS) in X-ray emission spectroscopy.                             | <i>16,K2,CO5</i> |