ANDHRA UNIVERSITY
TRANS-DISCIPLINARY RESEARCH HUB

METALLURGY

Unit -1 Fundamentals of Materials Science and Engineering

Atomic structure and bonding in materials, Crystal structure and defects, Phase diagrams and phase transformations ,Mechanical behaviour of materials

Unit -2 Physical Metallurgy

Thermodynamics of metallurgical systems, Kinetics of phase transformations, Solidification of metals and alloys ,Heat treatment of metals and alloys.

UNIT-3 Extractive Metallurgy

Principles of metallurgical processes, Pyrometallurgy, hydrometallurgy, and electrometallurgy, Mineral processing and beneficiation Environmental issues in metallurgy.

UNIT-4 Materials Characterization Techniques

Microscopy and microanalysis techniques, X-ray diffraction and spectroscopy, Thermal analysis techniques, Mechanical testing techniques.

Unit-5 Advanced Topics in Metallurgy

Materials for energy applications, Nano structured materials, High-temperature materials, Materials for corrosion resistance

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MODEL QUESTION PAPER

Time: 3hrs **MaxMarks:100**

Answer 5 Questions. Allcarry equal marks(5x20=100)

1a) Describe the classification of minerals based on their crystal structure and chemical composition. Give examples of each.

OR

b) Explain the process of igneous rock formation and identify the different types of igneous rocks.

2 A) What is the difference between enthalpy and entropy? How are these thermodynamic properties used in physical metallurgy?

OR

B) What is the difference between diffusion-controlled and nucleation-controlled phase transformations? Provide examples of each.

3A) What are the advantages and disadvantages of using electrorefining versus electro-winning to extract metals from ores?

OR

B) Explain the difference between gravity separation and froth flotation in mineral processing.

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4 A) Explain the difference between differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA).

OR

B) What is the purpose of a tensile test and what properties can be determined from this test?

5 A)What are some of the challenges associated with developing materials that can withstand high temperatures?

OR

B) What are some common methods used to prevent corrosion of metals, and how effective are these methods?

6.A) Describe the different types of phase diagrams and their importance in materials science.

OR

B) Explain the mechanisms by which metals deform plastically.

7. A)What factors influence the structure of dendrites during solidification of alloys?

OR

B)Explain the process of quenching and how it can be used to control the microstructure of metals.

8. A)What are the principles behind the reduction of metal oxides to metals during pyrometallurgical processes?