Last Date of Submission: ……. **Section: CE 21/CE 22**

Babu Banarasi Das- National Institute of Technology & Management, Lucknow

Subject: Material Science (ROE-037)

Tutorial Sheet: I /Unit: 1

1. Discuss importance of engineering materials with proper illustration and examples.
2. Describe Bohrs Atomic Model along with its merits and limitations.
3. Differentiate between characteristics of Mendeleev Periodic Table and Modern Periodic Table with suitable examples.
4. What do you understand by Valence, Primary and Secondary Bonding? Justify by examples.
5. What are prerequisites of Molecular Orbital Theory?
6. What are Common Crystal Structures? Describe in detail.
7. Define concept of Packing Fraction and calculate PF values for simple, b.c.c and f.c.c systems.
8. Define Miller Indices? Draw (1, 1, T) plane on Body Centered tetragonal unit cell? Also, show its interaction with (1, 1, 0) Plane.
9. What is Crystal Imperfection? Discuss Frenkel and Schottky defect in crystalline solids.
10. Write short notes on the following:
    - **a)** Pauli Exclusion Principle
    - **b)** Hund's Rule
    - **c)** Heisenberg Uncertainty Principle
    - **d)** Unit Cell
    - **e)** Ionic Radii and Atomic Radii
    - **f)** Ionization Potential
    - **g)** Effective Nuclear Charge and Shielding Effect
    - **h)** Diamond structure
    - **i)** Screw Dislocation and Edge Dislocation
    - **j)** Burgers Circuit and Burgers Vector

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Last Date of Submission: ……. **Section: CE 21/CE 22**

Babu Banarasi Das- National Institute of Technology & Management, Lucknow

Subject: Material Science (ROE-037)

Tutorial Sheet: II /Unit: 2

1. Explain Gibbs Phase Rule. How it is used? Give no of Variables and degree of Freedom?
2. Define briefly Griffith Theory of Brittle Fracture.
3. Suggest the methods to improve fatigue life of materials and its effects.
4. Draw any Hardness Testing Machine and explain its working Principle.
5. Describe various steps involved in preparation of Test Sample.
6. Discuss ASTM no for Grain size determination.
7. Differentiate between the **i)** Eutectoid and Eutectic **ii)** Peritectoid and Peritectic
8. Define the Stress-Strain Curve.
9. Write a note on terms Creep, Fracture, Fatigue and discuss the effects of these on material strength and properties.
10. Write short notes on the following:
    - **a)** Percentage Elongation
    - **b)** Re-crystallization Temperature
    - **c)** Limit of Proportionality
    - **d)** Elastic Limit
    - **e)** Tensile Strength vs Breaking Strength
    - **f)** Lower and Higher Yield Point
    - **g)** Cementite Form
    - **h)** ASTM
    - **i)** Compound Microscope
    - **j)** Principle of Electron Microscopy

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Last Date of Submission: ……. **Section: CE 21/CE 22**

Babu Banarasi Das- National Institute of Technology & Management, Lucknow

Subject: Material Science (ROE-037)

Tutorial Sheet: III /Unit: 3

1. Enlist various non ferrous metals, their characteristics and applications.
2. What do you understand by TTT diagram? Describe different phases of this diagram.
3. What is Heat treatment? Why it is done?
4. Differentiate between Annealing and Normalizing?
5. Discuss types, application of various alloys of Aluminuim Metal.
6. Write the various reactions involved in Blast Furnace during Steel manufacturing.
7. Differentiate between Tempering and Case Hardening.
8. Describe about the different alloys of Chromium and Zinc.
9. Briefly define about any five types of cast Iron based Alloys.
10. Write short notes on the following:
    - **a)** Gun Metal
    - **b)** Open Hearth furnace
    - **c)** Babbit Metal
    - **d)** Bell metal
    - **e)** Stainless Steel and Carbon Steel
    - **f)** Hindalium
    - **g)** Critical Temperature
    - **h)** Reverberatory Furnace
    - **i)** Martensite
    - **j)** Acidic and Basic Flux

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Babu Banarasi Das- National Institute of Technology & Management, Lucknow

Subject: Material Science (ROE-037)

Tutorial Sheet: IV /Unit: 4

1. Explain domain theory of Magnetism.
2. What are semi conductors? Differentiate between Intrinsic and Extrinsic semiconductors with suitable examples?
3. Define characteristics of Soft and hard magnetic materials with suitable examples.
4. Explain the B-H curve along with the diagram?
5. What are Type I and Type II Super-conductors?
6. Write a note of different magnetic storage devices.
7. Describe Meisner Effect? Discuss its importance.
8. Write short notes on the following:
   - **a)** Ferro-magnetism
   - **b)** Ferri-magnetism
   - **c)** Neel Temperature
   - **d)** Curie Temperature
   - **e)** Ferrites
   - **f)** P-n Junction
   - **g)** Insulators
   - **h)** Energy Band Theory
   - **i)** Anti-ferromagnetic Substances
   - **j)** Hysteresis Loss

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Babu Banarasi Das- National Institute of Technology & Management, Lucknow

Subject: Material Science (ROE-037)

Tutorial Sheet: V /Unit: 5

1. What are fibers reinforced plastics? What are properties and limitations of these materials?
2. Name different types of Glasses and discuss properties of Borosilicate glass material.
3. What do you understand by Ceramic Material? How it is different from Cermet?
4. Define the processing mechanism for Ceramics.
5. Classify the plastics on the basis of various available criteria's with proper examples.
6. Illustrate the description, properties and applications of Refractory Materials.
7. What do you understand by Corrosion? Discuss its drawbacks and preventive strategies.
8. Describe Bio-plastics along with merits and demerits associated with this material.
9. What are Smart Materials? Classify different smart materials on the basis of their property.
10. Write short notes on the following:
    - **a)** Composite Materials
    - **b)** Thermoset Polymers
    - **c)** Thermoplastic Materials
    - **d)** Linear Polymers
    - **e)** Addition and Condensation Polymers
    - **f)** Bakelite
    - **g)** Energy Band Theory
    - **h)** Reinforcement Process

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