U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E.   Semester: III
Branch: Chemical Engineering   Duration: 3 hrs.
Course Code: 19CY3DCMCA   Max Marks: 100
Course: Materials Chemistry and Applications

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1	a)	Explain secondary bonding with examples. Derive an expression for ion-dipole interaction.	**8**
	b)	Explain the band theory of metals. Based on band theory, discuss the conductivity in solids.	**6**
	c)	What are dispersion (London) intermolecular forces? Discuss why Cl_2 is a gas, Br_2 is a liquid, and I_2 is a solid.	**6**

UNIT - II

2	a)	Explain the construction, working, and applications of transmission electron microscopy.	**8**
	b)	X-rays with wavelength 1.54 Å are diffracted from the {1 1 0} planes of a cubic crystal with unit cell dimension a = 6 Å. Calculate Bragg's angle, θ for the first-order reflection.	**6**
	c)	What are non-stoichiometric crystals? Discuss any two types of defects in non-stoichiometric crystals.	**6**

UNIT - III

3	a)	Discuss the general formula and properties of zeolites. Explain a method of preparation of zeolites.	**8**
	b)	Give examples of bifunctional catalysts. Explain why a bifunctional catalyst is needed for steam reforming.	**6**
	c)	Discuss the mechanism of base-catalyzed reaction by taking an appropriate example.	**6**

OR

4	a)	What is the function of the catalytic converter in an IC engine? Explain the role of catalysts used in them.	**8**
	b)	What are organometallic catalysts? Discuss their industrial relevance with an examples.	**6**
	c)	Explain the reactant and the product selectivity of zeolite catalysts with relevant examples.	**6**

UNIT - IV

5   a)   Discuss the phase diagram of iron – iron-carbide system. What is a eutectic reaction?   **8**

    b)   State Gibbs phase rule. Discuss (i) condensed phase rule, and (ii) eutectic system.   **6**

    c)   What are ferrous alloys? Explain the properties and applications of the common ferrous alloys.   **6**

OR

6   a)   What are non-ferrous alloys? Elaborate on the composition, properties, and applications of (i) copper alloys, and (ii) nickel alloys.   **8**

    b)   What are phase diagrams? Discuss the phase diagram of single-component iron system.   **6**

    c)   Discuss the isothermal transformation (TTT) curve for eutectoid steel.   **6**

UNIT - V

7   a)   With a neat sketch illustrate the manufacture of soda glass.   **8**

    b)   Discuss any one mechanism of action of lubricants.   **6**

    c)   What are ceramics? What are its general properties and applications?   **6**

*****