Course Code: 23HS0803 **R23**

UNIT – I
WATER TECHNOLOGY

1	Define the following a) Temporary hardness b) Permanent hardness c) EDTA d) Reverse osmosis e) Scale and Sludge	[L1][CO1]	[10M]
2	Describe the estimation of hardness by EDTA method.	[L3][CO1]	[10M]
3	a) Define hardness. Distinguish between hard water and soft water? b) How do you estimate dissolved oxygen in water by Winkler's method.	[L3][CO1] [L4][CO1]	[4M] [6M]
4	a) Explain about the priming and foaming? b) Explain the process of scale and sludge formation in boilers.	[L2][CO1] [L2][CO1]	[5M] [5M]
5	a) Explain in detail about the Boiler corrosion. b) What are the specifications of the drinking water BIS and WHO Standards?	[L2][CO1] [L1][CO1]	[5M] [5M]
6	Explain with a neat sketch the various steps involved in Industrial Water Treatment.	[L2][CO1]	[10M]
7	a) What is Caustic embrittlement? Explain in detail. b) Discuss different types of internal treatments of industrial water.	[L1][CO1] [L1][CO1]	[4M] [6M]
8	Briefly explain about any three boiler troubles and their treatment.	[L2][CO1]	[10M]
9	a) Describe the Ion exchange process for demineralization of water? b) What are the advantages and disadvantages of Ion exchange process?	[L3][CO1] [L1][CO1]	[6M] [4M]
10	a) Explain about demineralization of brackish water by Reverse Osmosis. b) Explain about desalination of brackish water by Electro dialysis.	[L2][CO1] [L2][CO1]	[5M] [5M]
11	Write short notes on: a) What are the units to express hardness? b) Write the specifications of Potable water.	 [L1][CO1] [L1][CO1]	 [5M] [5M]

UNIT - II
ELECTROCHEMISTRY AND APPLICATIONS

1	Write the following a) Primary and Secondary battery b) Corrosion c) Single electrode potential d) Fuel Cell e) Pilling Bed worth ratio	[L1][CO2]	[10M]

Course Code: 23HS0803 **R23**

2	a) What is Electrochemical cell? Explain the construction & working principle of Electrochemical cell with neat diagram. b) Calculate the single electrode potential of zinc in 0.05 M ZnSO4 solution at 25 ^{0}C. E^0Zn/Zn^{2+} = -0.763V.	[L1][CO2] [L3][CO2]	[6M] [4M]
3	Derive the Nernst equation for a single electrode potential and write its applications.	[L2][CO2]	[10M]
4	a) Write a note on Zinc-air battery b) Explain the Construction and working of NICAD battery.	[L1][CO2] [L2][CO2]	[5M] [5M]
5	a) Write a note on Lithium-Ion rechargeable cell. b) Describe the Construction and Working of Hydrogen– Oxygen Fuel cell.	[L1][CO2] [L3][CO2]	[5M] [5M]
6	Explain about electrochemical theory of corrosion.	[L3][CO2]	[10M]
7	Explain the process of a) Galvanic corrosion b) Oxidation corrosion	 [L3][CO2] [L3][CO2]	 [5M] [5M]
8	Explain about Chemical theory of corrosion	[L2][CO2]	[10M]
9	a) Write a note on sacrificial anodic protection? b) Define the importance of the Impressed Current Cathodic protection?	[L1][CO2] [L1][CO2]	[5M] [5M]
10	a) What is Electroplating? Explain electroplating of Nickel and Copper? b) What is Differential Aeration cell corrosion? Give the suitable Examples.	[L2][CO2] [L1][CO2]	[5M] [5M]
11	Explain various factors influencing the rate of corrosion.	[L3][CO2]	[10M]

UNIT-III
POLYMERS AND FUEL CHEMISTRY

1	Define the following a) Polymerization b) Octane number c) Cetane number d) Monomer e) Biofuel	[L1][CO3]	[10M]

Course Code: 23HS0803 **R23**

2	a) What is functionality of monomer? b) Write about synthesis, properties and applications of Polystyrene.	[L1][CO3] [L1][CO3]	[5M] [5M]
3	a) Explain the chain growth and step growth of polymerization with examples. b) Discuss the synthesis, properties and applications of Nylon – 6, 6.	[L1][CO3] [L1][CO3]	[5M] [5M]
4	Explain the following mechanism of Addition polymerization. a) Free-radical addition polymerization b) Cationic addition polymerization	 [L2][CO3] [L2][CO3]	 [5M] [5M]
5	a) Distinguish between Thermoplastics and Thermosetting plastics. b) Describe the preparation, properties and uses of Bakelite.	[L4][CO3] [L3][CO3]	[5M] [5M]
6	Write the preparation, properties and applications of the following polymers a) Buna-S rubber. b) Buna-N rubber. c) Thiokol rubber.	 [L2][CO3] [L2][CO3] [L2][CO3]	 [4M] [3M] [3M]
7	a) Write about anionic addition polymerization. b) Describe the synthesis, properties and applications of Polyvinyl Chloride.	[L2][CO3] [L2][CO3]	[5M] [5M]
8	a) Explain the Proximate analysis of coal with its significance. b) Discuss the ultimate analysis of coal with its significance.	[L2][CO4] [L2][CO4]	[5M] [5M]
9	Describe the fractional distillation of petroleum.	[L3][CO4]	[10M]
10	a) What is significance of the Fuels for IC Engines? b) Write a note on Octane value and Cetane value.	[L1][CO4] [L1][CO4]	[5M] [5M]
11	a) What is the significance of propane and methanol fuels? b) What is the importance of the Ethanol and Biofuel?	[L1][CO4] [L1][CO4]	[5M] [5M]

UNIT - IV
MODERN ENGINEERING MATERIALS

1	Define the following a) Composite b) Refractories c) Lubricant d) Viscosity e) Cement	 [L1][CO5]	 [10M]

Course Code: 23HS0803 **R23**

2	a) Classify the composites materials. b) Explain factors affecting the refractory materials.	[L1][CO5] [L1][CO5]	[5M] [5M]
3	a) Give the classification of refractories with examples. b) Write a note on properties of the refractor materials.	[L1][CO5] [L1][CO5]	[5M] [5M]
4	a) Determine the viscosity of lubricating oil by Redwood Viscometer. b) Discuss the applications of refractory materials.	[L2][CO5] [L2][CO5]	[6M] [4M]
5	Write short notes on: a) Flash and Fire point b) Cloud point and saponification	 [L1][CO5] [L1][CO5]	 [5M] [5M]
6	Write short note on following mechanism. a) Hydrodynamic Lubrication b) Thick Film Lubrication	 [L1][CO5] [L1][CO5]	 [5M] [5M]
7	a) Give the classification and examples of the lubricants? b) Discuss the functions and properties of lubricating oils.	[L1][CO5] [L2][CO5]	[5M] [5M]
8	Explain in detailed about manufacture of Portland Cement?	[L2][CO5]	[10M]
9	a) Write about constituents of Portland cement. b) Explain in detail about setting and hardening of Portland cement?	[L1][CO5] [L2][CO5]	[5M] [5M]
10	a) Summarize the applications of lubricants. b) Discuss the properties of composite materials.	[L1][CO5] [L1][CO5]	[5M] [5M]
11	a) Write a note on Fiber and structural reinforced composite materials. b) Write a brief note on engineering applications of composite materials.	[L1][CO5] [L1][CO5]	[5M] [5M]

UNIT–V
SURFACE CHEMISTRY AND NANOMATERIALS

1	Write the following a) Colloids b) BET equation c) Micelle d) Nanomaterial e) Stabilizing agents	[L1][CO6]	[10M]

Course Code: 23HS0803 **R23**

2	a) Discuss the synthesis of colloids by Braggs method. b) Write a note on Micelle formation.	[L1][CO6] [L1][CO6]	[5M] [5M]
3	Write a note on following a) Stabilization of colloids by stabilizing agents. b) Stabilization of nanomaterials by stabilizing agents.	 [L1][CO6] [L1][CO6]	 [5M] [5M]
4	Give an account of chemical and electrochemical methods of preparation of nano metals.	[L1][CO6]	[10M]
5	a) Explain different types of Adsorptions of Isotherm b) Discuss the applications of nanomaterials in catalysis and medicine.	[L1][CO6] [L1][CO6]	[5M] [5M]
6	a) Explain about the stabilization of colloids by Solid-Gas Interface. b) Explain the preparation of Nano metal oxides by chemical and electrochemical methods	[L2][CO6] [L2][CO6]	[5M] [5M]
7	Write short notes on a) Types of Colloids b) Properties of Nonmetal & Nano metal Oxides	 [L2][CO6] [L2][CO6]	 [5M] [5M]
8	Summarize the applications of nanomaterials.	[L3][CO6]	[10M]
9	Discuss about the following a) Freundlich adsorption isotherms b) Langmuir adsorption isotherms.	 [L2][CO6] [L2][CO6]	 [5M] [5M]
10	a) Explain the BET Equation b) Write the characteristics of colloids.	[L2][CO6] [L1][CO6]	[5M] [5M]
11	a) Write the applications of Colloids. b) Explain about the stabilization of colloids by Solid-Liquid Interface.	[L1][CO6] [L2][CO6]	[5M] [5M]