

FE sem-I (NEP) / Branch - All / NOV-2025 / Q.P. code - 96621

Date - 26-12-2025

11

Time: 1:30 hours

Marks: 45

N.B.

1. Question No. 1 is compulsory.
2. Attempt any two questions from Question No.2 to Question No.5.
3. Draw a neat and well-labelled diagram, and write the chemical reaction wherever necessary.
4. Marks are given on the right side of the questions.

**1. ATTEMPT ANY FIVE QUESTIONS.**

- (a) Define calorific value and write the significance of proximate analysis of coal. 03
- (b) Explain the sacrificial anode cathodic protection method with a neat and well-labelled diagram. 03
- (c) Explain the terms involved in Gibbs phase rule with an example of a one-component system. (Phase, Component and Degree of Freedom) 03
- (d) Define the tensile strength of a polymer and explain its significance. 03
- (e) Discuss applications of composites. 03
- (f) Discuss super critical solvents with its applications. 03
- (g) How is the percentage of sulphur determined in a solid fuel? 03
2. (A) How can material selection and design prevent corrosion? Explain which protective coatings can be used for corrosion prevention. 06
- (b) Calculate the gross and net calorific value of coal having the following compositions. Carbon=85%, hydrogen=8%, sulphur=1%, nitrogen=2%, ash=4%, and the latent heat of steam is 587 cal/gm. 05
- (c) Write the conventional and green methods for the synthesis of adipic acid. 04
3. (a) Explain all types of chemical bonds existing in polymers. 06
- (b) Write notes on (a) reduced phase rule (c) applications of phase diagram. 05
- (c) Classify composites with the help of a diagram and an example of each class. 04
4. (a) Write short notes on crystallinity, number average molecular weight and fatigue of polymers. 06
- (b) Write about the synthesis and advantages of biodiesel. 05
- (c) 1.0 g of coal sample was digested (Kjeldahl method). The liberated ammonia was absorbed in 25 ml of N/10 H<sub>2</sub>SO<sub>4</sub>. To neutralise excess acid, 15 ml of 0.1 N NaOH was required. Determine the % nitrogen in the given sample of coal. 04
5. a) Explain the rusting of iron with the help of the electrochemical theory of corrosion and a diagram. 06
- (b) Define matrix and dispersed phase with its functions and examples. 05
- (c) An alloy of Cd and Bi contains 25% Cd. Find the mass of eutectic in 1 kg of alloy if the system contains 40% Cd. 04

\*\*\*\*\*

96621