

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Question No. 9 is compulsory and carries 20 marks. The candidate is required to attempt four questions selecting one question from each unit. Each question carries 10 marks.

UNIT-I

1. (a) What do you mean by caustic embrittlement? Differentiate between sludge and scale. Discuss various internal treatments for the removal of scale from boiler. (7)
- (b) A hard water sample has 30.0 ppm of carbonate ions. Calculate molarity of carbonate ions in the sample of water. (3)
2. (a) Discuss the construction and working of Li-ion battery and its comparison with lead-acid batteries. (6)
- (b) Define indicator electrode. Explain the determination of pH using hydrogen electrode. (4)

UNIT-II

3. (a) Discuss the detail comparison between chemical and electrochemical corrosion and protective measures for these types of corrosion. (7)
- (b) Explain with example, how the nature of metal influenced the corrosion process. (3)

4. Briefly explain the following terms of spectroscopy:

- (i) Finger print region
- (ii) Red and blue shift
- (iii) Chromophore and auxochrome (3+4+3 = 10)

UNIT-III

5. Write short note on following terms: (2.5×4=10)

- (i) Gross calorific value of fuel
 - (ii) Water gas
 - (iii) Construction of Bomb calorimeter
 - (iv) Knocking and anti-knock agent
6. (a) Give examples of semi-solid and solid lubricants along with their application and mechanism. (5)
 - (b) What is the significance of neutralisation and saponification number of the lubricants? (5)

UNIT-IV

7. (a) What do you mean by condensation polymerization? Give synthesis and application of phenol-formaldehyde resin. (6)
- (b) Define thermoplastic and thermosetting polymers with suitable examples. (4)
8. (a) Differentiate between natural and synthetic rubber. (3)
- (b) What do you mean by the term Graft copolymerization? (2)
- (c) Write a note on synthesis, properties and uses of carbon nanotubes. (5)

[P.T.O.]

9. (a) Define temporary hardness and Clark units of hardness.
- (b) Draw the repeating units of PMMA and PVC.
- (c) Give one example of each synthetic and natural lubricant.
- (d) Define cetane number and its significance.
- (e) Name the source and range of UV and visible e.m. radiations in spectrophotometer.
- (f) Define Beer-Lambert's law by mentioning the term involved.
- (g) Define hyperchromic shift with example.
- (h) Define the terms DO and COD.
- (i) Give the significance of e.m.f of the cell.
- (j) Give the applications of nano-wires. (2×10)