BT MRE–I(R/S)–12.21–1065 Reg. No. | | | | | | | | |

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B.Tech. Degree I Semester Regular/Supplementary Examination in Marine Engineering December 2021

19-208-0103 ENGINEERING CHEMISTRY

(2019 Scheme)

Time: 3 Hours Maximum Marks: 60

(5 × 15 = 75)

I. (a) Describe the determination of degree of hardness by EDTA method. (6)

(b) Explain Trickling filter process for sewage treatment. (4)

(c) A sample of hard water gives the following results on analysis: (5)

$Ca(HCO_3)_2$ = 16.2 ppm, $Mg(HCO_3)_2$ = 14.6 ppm, $CaCl_2$ = 11.1ppm, $MgCl_2$ = 9.5 ppm, $CaSO_4$ = 13.6 ppm, $MgSO_4$ = 12.0 ppm. What is the amount of lime and soda required for the treatment of the water sample?

OR

II. (a) With the help of a neat diagram, explain the electrodialysis method for desalination of brackish water. (5)

(b) Explain the ion exchange method for the removal of dissolved impurities and its advantages over other methods. (5)

(c) 0.4 g of $CaCO_3$ was dissolved in dilute HCl and diluted to 500 ml. 50 ml of this solution required 52 ml of EDTA solution for titration, while 50 ml of given hardwater required 16 ml of EDTA solution for titration. Calculate total hardness of water sample. (5)

III. (a) Discuss stoichiometric defects in crystals. (5)

(b) Explain the construction and working of nickel-cadmium battery, along with relevant reactions taking place. What are its advantages and applications? (5)

(c) E^o values of Li^+/Li, Zn^{2+}/Zn, Cu^{2+}/Cu, and Ag^+/Ag are -3.0 V, -0.77 V, +0.33 V and +0.80 V respectively. Which combination of electrodes would you use to construct a cell of highest potential, if ionic concentrations are 1.0 M, 0.1 M, 0.001 M and 0.01 M respectively? (5)

OR

IV. (a) Explain the construction and working of Weston cadmium cell (6)

(b) Write notes on super conductors. (4)

(c) Calculate EMF of the cell from the following data: (5)

$$Ni^{2+}(aq.) + 2e \rightarrow Ni(s) E^0 = 0.25v.$$

$$Cr^{3+}(aq.) + 3e \rightarrow Cr(s) E^0 = 0.74v$$

$$\left[Ni^{2+}\right] = 1 \times 10^{-4} \text{ and } \left[Cr^{3+}\right] = 2 \times 10^{-3} M.$$

V. (a) Discuss the methods of metallic coating for corrosion control. (6)

(b) Explain rusting of iron by applying electrochemical theory of corrosion. (6)

(c) A copper equipment should not possess a small steel bolt. Why? (3)

OR

(P.T.O.)

VI. (a) What are the different ingredients of varnishes? Explain their functions. How do they differ from paints? (6)

(b) Discuss the methods of prevention of corrosion by cathodic protection. (6)

(c) Iron corrodes faster than aluminium, even though iron is placed below aluminium in the electrochemical series. Why? (3)

VII. (a) How can the calorific value of a soiid fuel be determined experimentally? (6)

(b) Describe the Fischer-Tropsch process for the preparation of synthetic petrol. (6)

(c) On heating 1.5 g of coal in a silica crucible for 1 hour at 105° C the residue weighed 1.315 g. The crucible was then covered with a lid and strongly heated for 7 minutes at 950°C. The residue weighed 0.568 g. The crucible was then heated without the over, until constant weight was obtained. Calculate the percentage of proximate analysis. (3)

OR

VIII. (a) Discus the working of solar cells. (6)

(b) Write notes on: (5)

(i) Knocking of petrol

(ii) Cetane value.

(c) Calculate the gross and net calorific value if a sample of coal has the following percentage composition by weight = 78%, H = 5.2%,O = 10.1%, N = 2.2% and ash = 4.5 %. (4)

IX. (a) Discus different moulding techniques of polymers. (8)

(b) Describe the various ingredients used in the compounding of rubber, and their functions. (7)

OR

X. (a) What are Nylons? How are they prepared? What are their uses? (5)

(b) Describe the preparation, properties and uses of (10)

(i) Teflon

(ii) Terylene

(iii) Neoprene

(iv) Phenol-formaldehyde resin.

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