15-05-2026 FE SEM-II ALL BRANCHES C SCHEME EC-II QP CODE: 20009156

Time: 2 hours **Max. Marks 60**

N.B.

1. **Question No.1 is compulsory**
2. Attempt any **Three** Questions from the remaining Five Questions
3. Figures to the right indicate full marks
4. Atomic weight: C = 12, H = 1, O = 16, N = 14, S= 32, Cl =35.5

Q.1 **Answer any five from the following:** **15**

a) Write a note on Galvanic corrosion.

b) Define knocking. Give its disadvantages.

c) Give the difference between fluorescence and phosphorescence.

d) Explain in brief electrolytic cell with example.

e) What is Green chemistry? Give its significance.

f) Explain absorption spectrum in brief with diagram.

g) 1.4 g coal sample was kjeldahlised. Blank titration required 25 ml of 0.1 N NaOH solution. After absorption of liberated ammonia in 0.1N of sulphuric acid solution, back titration required 5 ml of 0.1N NaOH solution. Calculate percentage of nitrogen.

Q.2 a) Explain by which mechanism does rusting of iron takes place in acidic medium with the help of reactions and diagram. 6

b) Explain trans-esterification method for preparation of biodiesel from vegetable oil with reaction and give its advantages. 5

c) Write the cell reactions and calculate the standard emf of the following cell: 4

$Zn_{(s)} \mid Zn^{2+}_{(aq)}$ (1M) $\mid\mid Cu^{2+}_{(aq)}$ (1M) $\mid Cu_{(s)}$

Given: E^0_{Zn} = - 0.763 V and E^0_{Cu} = 0.337 V.

Q.3 a) What is Flame photometry? Explain it with respect to principle, working, diagram and applications. 6

b) Give construction and working of any one reference electrode with the help of diagram and reactions. 5

c) Calculate %atom economy for the following reaction with respect to cinnamaldehyde: 4

$C_6H_5CHO + CH_3CHO \rightarrow C_6H_5CH\text{-}CHCHO + H_2O$

Benzaldehyde Cinnamaldehyde

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Q.4 a) Calculate the volume and weight of air required for complete combustion of $1m^3$ of gaseous fuel having the following composition: H_2 = 35%, C_2H_6 = 25%, CH_4 =35%, N_2 = 2 %, CO_2 = 1%, O_2 = 2.0% (Molecular weight of air =28.949). 6

b) Explain the conventional and greener pathway for the synthesis of Indigo. Mention the principle associated with this synthesis. 5

c) Explain any two selection rules in spectroscopy. 4

Q.5 a) Explain the mechanism of 'Rusting of iron in water' with the help of diagram and reactions. 6

b) Determine %C & %H from the following observations in experiments of analysis of coal. 2.5g coal on burning in a combustion tube and passing the gases through tubes containing anhydrous $CaCl_2$ and KOH increases their weight by 1.2 g and 8.5g respectively. 5

c) Draw a well labelled Jablonski diagram. 4

Q.6 a) Explain sacrificial anode cathodic protection method of metal from corrosion with its principle, suitable diagram and applications. 6

b) A sample of coal was found to contain C = 77%, H = 5%, S = 3%, O = 1%, N = 2%, Ash = 12%. Calculate HCV and LCV using Dulong's Formula. 5

c) Draw a well labelled diagram of electromagnetic spectrum showing various regions. 4

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