BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MSC/IMSC/PRE-PHD **SEMESTER : III/IX**
BRANCH: CHEMISTRY **SESSION : MO/2022**

SUBJECT: CH506 ADVANCED ELECTROCHEMISTRY

TIME: 3:00 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) (i) Discuss in detail mass transfer mechanisms of electrochemical reaction with special reference to diffusion, migration and convection. [2+3]
(ii) At 25 ^{0}C the exchange current density of a Pt | H_2 (g) | H^+ (aq) electrode is 0.79 mA cm^{-2} . Calculate the current flowing through a standard electrode of area 5.0 cm^2 when the overpotential is + 5.0 mV.

Q.1(b) Write the Butler–Volmer equation and explain the terms involved. Discuss the variation of current density with overpotential. What are the limiting cases of Butler–Volmer equation? [5]

Q.2(a) (i) Discuss the sacrificial anodic protection method of metallic structures. [2+3]
(ii) What do you understand by corrosion? Discuss in detail the electrochemical theory of corrosion.

Q.2(b) Discuss the pourbaix diagram of the potential E (V) VS SHE against pH. What is the significance of it? [5]

Q.3(a) Discuss the principle of polarographic analysis. What are the applications of polarographic analysis? [5]

Q.3(b) Discuss the principle of cyclic voltammetry along with the suitable example of a reversible & irreversible system. [5]

Q.4(a) Briefly discuss the principle of electrochemical impedance spectroscopy. What information are obtained from Nyquist plot? [5]

Q.4(b) Briefly discuss the principle of electrochemical quartz crystal microbalance. [5]

Q.5(a) Discuss the hydrogen-oxygen fuel cell in details. [5]

Q.5(b) How supercapacitors are classified? Discuss the working principle of electrochemical double layer supercapacitors. [5]

:::::23/11/2022:::::E