

International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Examination, Spring 2019

Course Code: CHEM 2301

Time: 2 hours 30 minutes

Program: B.Sc. Engg. (EEE)

Course Title: Chemistry

Full Marks: 50

Part A

[Answer any two questions from the followings; figures in the right margin indicate full marks.]

- 1(a). What are 'Faradays laws' of electrolysis? Discuss their importance. 3
- 1(b). Define equivalent conductance and specific conductance. Explain clearly why at dilution equivalent conductance increases and specific conductance decreases. 4
- 1(c). Calculate the specific conductivity of the solution if 0.5N solution of a salt occupying a volume between two Pt electrodes 1.72 cm apart and of area 4.5 sq. cm has a resistance of 15 ohms. 3
- 2(a). What are colligative properties of dilute solution? 2
- 2(b). Deduce a relation between mole fraction and relative lowering of vapour pressure. 4
- 2(c). Calculate the molarity and normality of a solution containing 8g of NaOH dissolved in 1 L solution. 4
- 3(a). Outline the ways of expressing concentration of solution. 4
- 3(b). Briefly describe theory of steam distillation. 3
- 3(c). Discuss moving boundary method for the determination of transport number of ions. 3

Part B

[Answer any three questions from the followings; figures in the right margin indicate full marks.]

- 4(a). Define reversible reactions. Give some examples of reversible reactions. 3
- 4(b). What is the Law of mass action? Establish relationship between K_C and K_P . 4
- 4(c). Give the equilibrium constant expression for this reaction: 3
- $$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$$
- 5(a). What is pseudo order reaction? Explain. 2
- 5(b). Derive expression for the rate constant of first order reaction. Show that half-life period is independent of initial concentration. 4
- 5(c). From the following data for the decomposition of N_2O_5 in CCl_4 solution at 48°C , 4
precise that the reaction is first order.
- | | | | | |
|------------------------------|--------|------|-------|----------|
| t(min.) | : 10 | 15 | 20 | ∞ |
| Vol. of O_2 evolved | : 6.30 | 8.95 | 11.40 | 34.75 |
- 6(a). What is adsorption and its classification? 2
- 6(b). Write the assumptions of Langmuir for adsorption and deduce Langmuir adsorption isotherm equation. 5
- 6(c). Discuss the application of colloids. 3
- 7(a). Explain rate of reaction and rate law. 2
- 7(b). The standard free energy change for the reaction 5
- $$\text{N}_{2(\text{g})} + \text{O}_{2(\text{g})} \rightleftharpoons 2\text{NO}_{(\text{g})}; \text{ is } +173.1 \text{ KJ/mol. Calculate } K_p \text{ for reaction at } 25^\circ\text{C}.$$
- 7(c). Distinguish order and molecularity of the chemical reactions. 3

International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Examination Spring-2019
 Course Code: EEE 2303
 Time: 2 hours 30 minutes

Program: B.Sc. Engg. (EEE)
 Course Title: Electrical Machine I
 Full Marks: 50

Part A

[Answer any two questions from the followings; Figures in the right margin indicate full marks.]

- 1(a). What is an electrical generator? Explain the working principle of a DC generator. 4
 1(b). Name the main parts of a DC generator. Explain the importance of brush and commutator for it. 3
 1(c). A short-shunt compound generator delivers a load current of 100A at 380 volt and has armature, series field and shunt field resistances of 0.2Ω , 0.1Ω and 400Ω respectively. Calculate the generated voltage and armature current. Allow 4V brush contact drop. 3
 2(a). (i) What do you understand by critical resistance of shunt generator? 1
 (i) What is the function of compensation winding in dc generator? Where they are used? 2
 2(b). Briefly describe the losses in a DC generator. 3
 2(c). The open circuit characteristics of a dc shunt generator driven at rated speed is as follows: 4
- | | | | | | | | | |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Field Amperes: | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 3.5 |
| Induced Voltage: | 60 | 120 | 138 | 145 | 149 | 151 | 152 | 152 |

If the resistance of the field circuit is adjusted to 53Ω , calculate the open circuit voltage and load current when the terminal voltage is 100V. Neglect armature reaction and assume an armature resistance of 0.1Ω

- 3(a). What are the conditions for voltage buildup of a shunt generator? 2
 3(b). What are the classifications of generator according to field excitations? Describe with diagram. 4
 3(c). In a long-shunt compound generator, the terminal voltage is 230V when generator delivers 150A. The shunt field resistance is 92Ω , series field resistance is 0.015Ω , divertor (parallel to series field) resistance is 0.03Ω , and armature resistance is 0.032Ω . Determine; (i) Induced emf, (ii) Total power Generated and (iii) Distribution of power. 4

Part B

[Answer any three questions from the followings; figures in the right margin indicate full marks.]

- 4(a). Draw (i) the torque vs armature current, (ii) speed vs armature current and (iii) speed vs torque characteristic curves of DC series and shunt motors. 3
 4(b). What is the significance of back emf? 2
 4(c). A 230 V dc shunt motor has an armature resistance of 0.5Ω and field resistance of 115Ω . At no-load, the speed is 1200 rpm, and the armature current is 2.5 A. On application of rated load, the speed drops to 1120 rpm. Determine the line current and power input when the motor delivers rated load. 5
 5(a). What is the difference between squirrel cage induction motor and phase wound induction motor? 2
 5(b). Describe with diagram the principle how a rotating flux is produced in a two-phase induction motor. 5
 5(c). A 4-pole 3-phase induction motor operates from a supply whose frequency is 50 Hz. Calculate (i) synchronous speed of the rotor, (ii) actual speed of the rotor when slip is 0.05, (iii) frequency of the rotor current when speed is 600rpm. 3
 6(a). Draw the equivalent circuit of induction motor using rotor equivalent circuit. 3
 6(b). Show that the no load test of induction motor is analogous to the open circuit test of transformer and the similarly block rotor test of induction motor is equivalent of short circuit test of transformer. 5
 6(c). How G_0 and B_0 can be found from induction motor? 2
 7(a). What is slip (s)? How it affects the frequency of the rotor current. What is the significance of $s = 1$? 4
 7(b). What are the methods by which speed of dc motor can be controlled? Explain. 4
 7(c). What are the differences between dc shunt motor and dc series motor? 2