B.Sc. Eng. (EEE) 1st Semester 3 March 2020 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Mid Semester Examination — Winter Semester, A.Y. 2019-2020
Course Code: Chem 4121 — Time : $1\frac{1}{2}$ hours
Course Title: Engineering Chemistry — Full Marks : 75

There are **4 (Four)** Questions. Answer any **3 (three)** of them.
Use the graph paper wherever necessary. Marks in the Margin indicate the full marks.

1 a) Derive integrated and differential form of Kirchhoff equation. 9

b) Classify element according based on their electron configurations. Find out the position of Ni in the periodic table. 10

c) The heat of combustion of ethyl alcohol is -330 kcal. The heat of formation of $CO_2(g)$ and $H_2O(l)$ are -94.03 kcal and 68.39 kcal, respectively. What is the heat of formation of ethyl alcohol? 6

2 a) Only draw the shape (and write the name) of the following molecules according to VSEPR model (i) $SiCl_4$, (ii) SF_6, (iii) XeF_2, and (iv) PF_5. 8

b) What is hydrogen bond? Classify hydrogen bond with examples. 5

c) Draw the molecular orbital diagram of CO molecule. State the bond order and magnetic properties. 7

d) What is octet rule? Write the limitation of octet rule. 5

3 a) State and explain Heisenberg's Uncertainty principle. Show the applicability of Uncertainty principle. 6

b) Derive an expression for the wavelength of electron which undergo a transition in a hydrogen atom. 12

c) Calculate the wavelength and energy of the emitted photon for the 4^{th} line of the Lyman series of the hydrogen atom emission spectra. 7

4 a) What is colligative property of a dilute solution? Show that lowering of vapour pressure is a colligative property. 7

b) Derive a relation between Depression of freezing point of a solution by the addition of nonvolatile solute and molar mass of the solute with the help of vapour pressure-temperature diagram. 12

c) The formula of an oligomer is $(C_6H_{10}O_5)n$, where n averages 200.00. When 0.798 g of compound is dissolved in 100.0 mL of water solution, what is the osmotic pressure at 25^0C? 6

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