International Islamic University Chittagong (IIUC)

Department of Electronic and Telecommunication Engineering

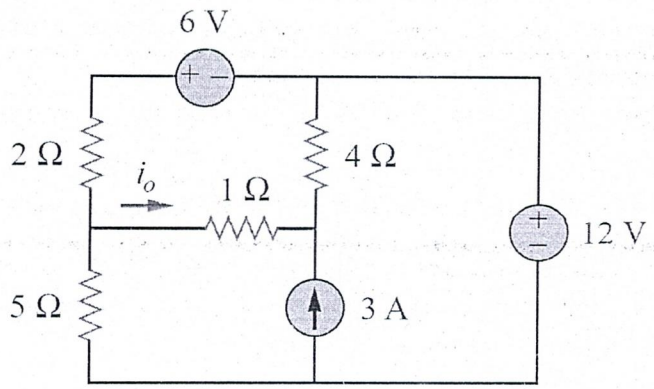
Final Examination

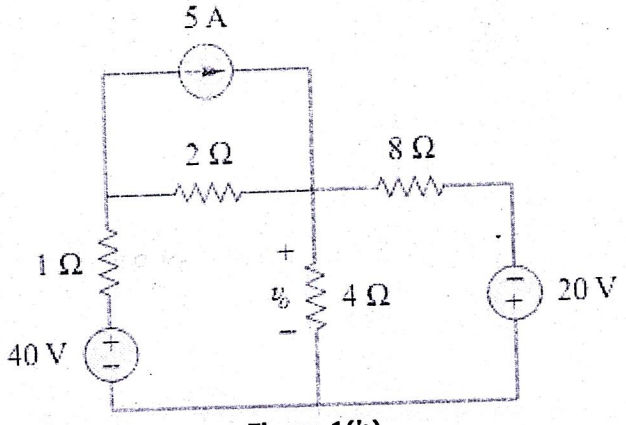
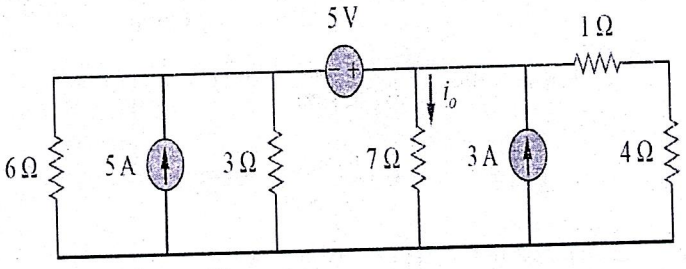
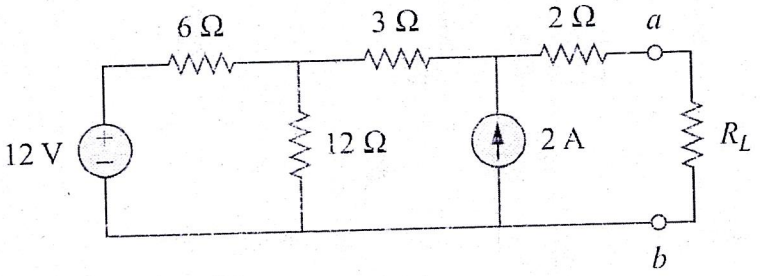
Program: **B.sc (Engg.)**
Course Code: **ETE-1121**
Total Marks: **50**

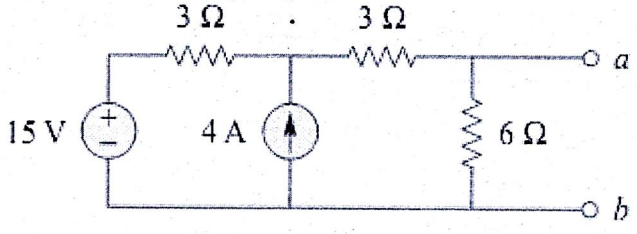
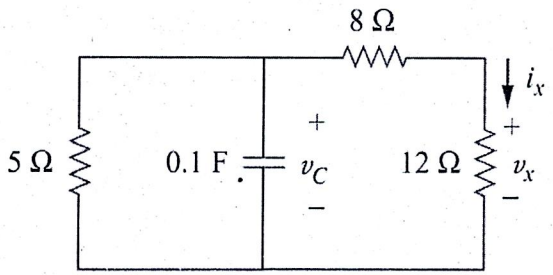
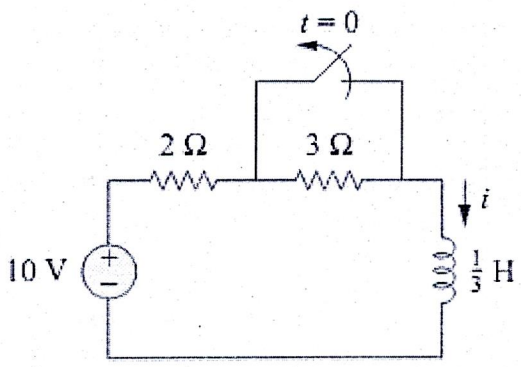
Semester: **Autumn 2022**
Course Title: **Electrical Circuit I DC**
Time: **2 Hours 30 Minutes**

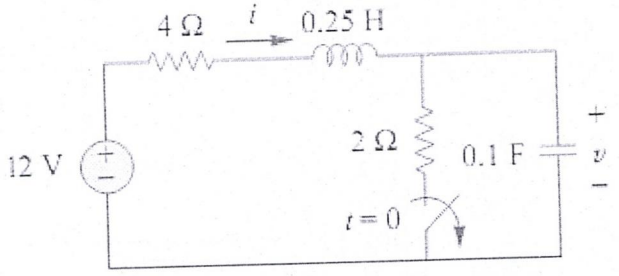
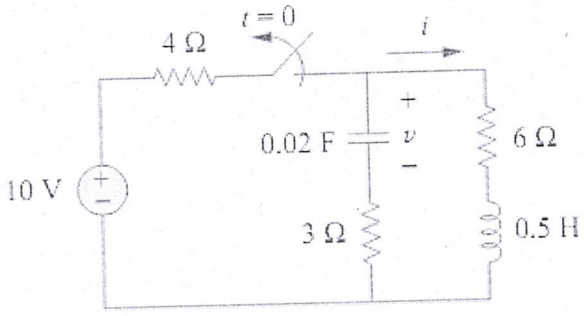
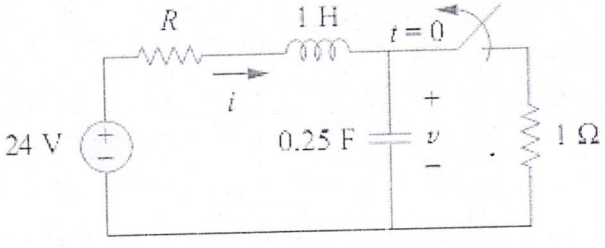
(i) Answer all the questions. The figures in the right-hand margin indicate full marks. **(ii) Course Outcomes (COs) and Bloom's Levels are mentioned in additional Columns.**	
Course Outcomes (COs) of the Questions	
CLO 1	Understand the concepts of basic Circuit element, basic circuit, and basic circuit Laws and magnetic circuit laws.
CLO 2	Introduce series parallel circuit and different network theorem to analysis the circuits.

Bloom's Levels of the Questions						
Letter Symbols	**R**	**U**	**Ap**	**An**	**E**	**C**
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

PART A					
Q1	**a)**	*"Nodal analysis, which is based on a systematic application of Kirchhoff's current law (KCL), and mesh analysis, which is based on a systematic application of Kirchhoff's voltage law (KVL)"* Is above statement true? Justify the Statement. Also explain the terms "***super node***" and "***super Mesh***".	**CLO2**	**E**	**5**
	b)	Use *mesh analysis* to obtain i_o in the circuit of ***Fig. 1(b).***  **Figure 1(b)**	**CLO2**	**Ap**	**5**
		OR			

		Using *nodal analysis*, find v_o in the circuit of ***Fig. 1(b)***  **Figure 1(b)**	**CLO2**	**Ap**	**5**
Q2	**a)**	Find i_o in the circuit of ***Fig. 2(a)*** using *source transformation*.  **Figure 2(a)**	**CLO2**	**Ap**	**5**
	b)	Find the value of R_L for *maximum power transfer* in the circuit of ***Fig. 2(b).*** Find the ***maximum power***.  **Figure 2(b)**	**CLO2**	**Ap**	**5**
		OR			

		Find the ***Norton equivalent circuit*** for the circuit in ***Fig. 2(b)***, at terminals a-b.  **Figure 2 (b)**	**CLO2**	**Ap**	**5**
		PART B			
Q3	**a)**	*"The equivalent capacitance of series-connected capacitors is the reciprocal of the sum of the reciprocals of the individual capacitances"* Prove the statement.	**CLO2**	**E**	**5**
	b)	In ***Fig. 3(b),*** let $v_c(0) = 15$ .V Find v_c, v_x, and i_x for ***t>0***.  **Figure 3(b)**	**CLO2**	**Ap**	**5**
		OR			
		Find ***i(t)*** in the circuit of ***Fig. 3(b)*** for ***t>0***. Assume that the switch has been closed for a long time.  **Figure 3(b)**	**CLO2**	**Ap**	**5**

Q4.	a)	The switch in ***Fig. 4(a)*** has been closed for a long time. It is open at ***t=0.*** Find: (i) $i(0^+)$, $v(0^+)$ (ii) $di(0^+)/dt$, $dv(0^+)/dt$ (c) $i(\infty)$, $v(\infty)$.  **Figure 4(a)**	**CLO2**	**Ap**	**5**
	b)	Find ***i(t)*** in the circuit of ***Fig. 4(b)***. Assume that the circuit has reached steady state at $t = 0^-$.  **Figure 4(b)**	**CLO2**	**Ap**	**5**
		OR			
		For the circuit in ***Fig. 4(b)***, find ***v(t)*** and ***i(t)*** for $t > 0$. Consider $R=4\ \Omega$.  **Figure 4(b)**	**CLO2**	**Ap**	**5**
Q5.	a)	Explain the terms "***flux***" and "***magnetic force.***" Also Briefly Explain ***Ampère's Circuital Law*** for magnetic circuits.	**CLO1**	**U**	**5**

	b)	Find the value of ***I*** required to establish a magnetic flux of ***φ = 0.75 × 10-4 Wb*** in the series magnetic circuit in Fig. 5(b).	**CLO2**	**Ap**	**5**

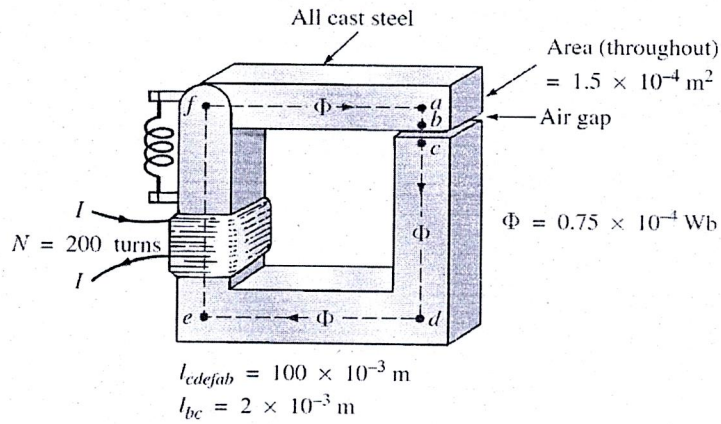


Figure 5(b)

Appendix:

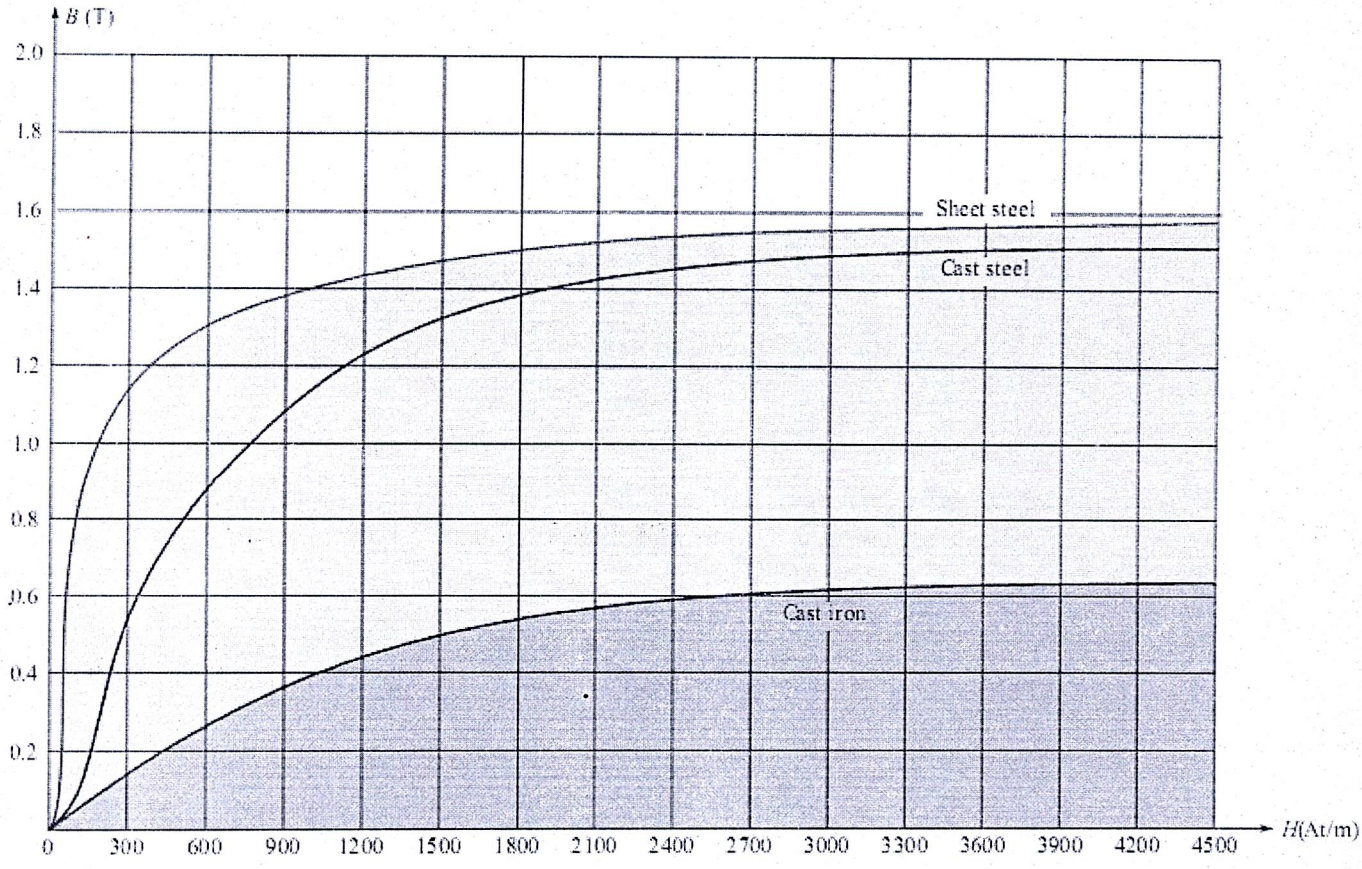


Figure Appendix 1