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International Islamic University Chittagong (IIUC)

Department of Electronic and Telecommunications Engineering

Final Examination **Semester: Spring, 2018**

Course Code: ETE- 1103 **Course Title: Electrical Circuit-I DC**

Time: 2 hours and 30 minutes Total Marks: 50

Group - A

[Answer any two questions of the following sets]

1. a) Determine the node voltages in the circuit shown in Fig. 1 4

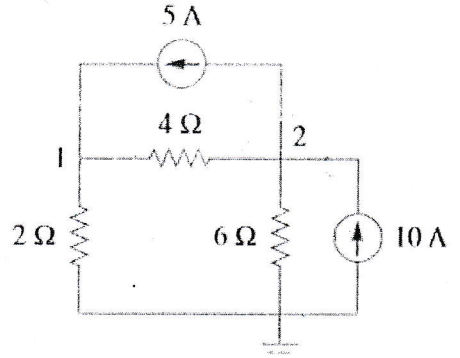


Fig.1

b) Use Fig. 2 to determine mesh currents 4

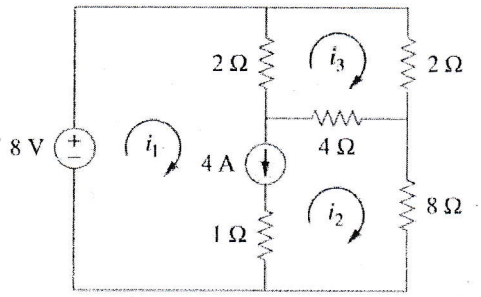


Fig. 2

c) Point out when Supernode happens in Nodal Analysis. 2

2. a) By using superposition theorem examine the current through R_1 shown in figure 3. 5

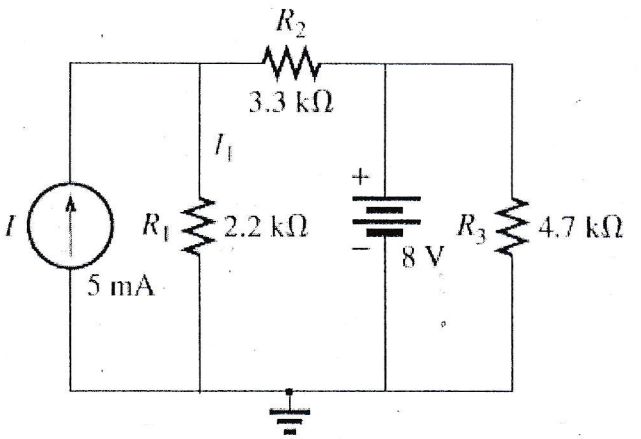


Fig: 3

b) From the following data examine the current I through resistor R4 in fig 4 by using 5

Reciprocity theorem. Where, $E = 45V$, $R_1 = 12\Omega$, $R_2 = 6\Omega$, $R_3 = 2\Omega$, $R_4 = 4\Omega$.

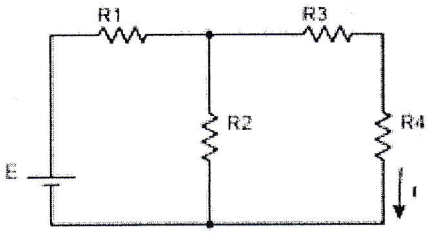


Fig: 4

3. a) Point out the differences between Thevenin's Theorem and Norton's Theorem. 2

b) Using Thevenin's theorem, determine the equivalent circuit to the left of the a-b terminal in Fig. 5 and hence determine I. 5

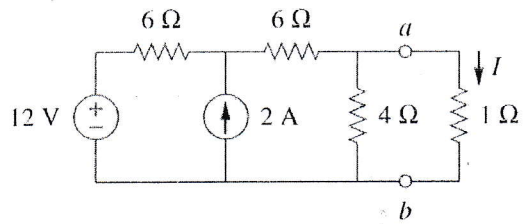


Fig. 5

c) Explain Maximum Power Transfer Theorem in your own words. If a Thevenin's equivalent circuit has R_{th} = 9Ω and V_{th} = 22V, Determine the load resistance that will result in Maximum Power getting transferred to the load. Also determine the maximum power. 3

Group - B

[Answer any three questions of the following sets]

4. a) Design Thevenin equivalent circuit for the network in the shaded area in Fig. 6. 5

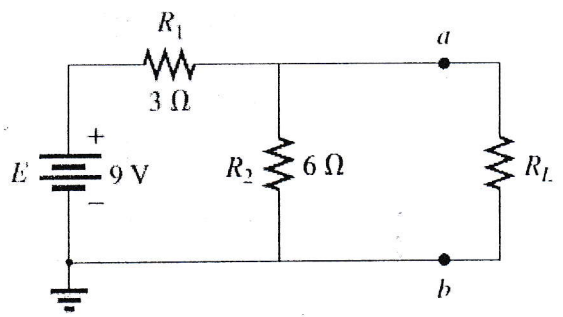


Fig: 6

b) For the network of fig 7 examine the value of R_L for maximum power to R_L and evaluate the maximum power. Given $I = 6A$, 5

$E_1 = 68V$, $R_1 = 3\Omega$, $R_2 = 10\Omega$, $R_3 = 2\Omega$.

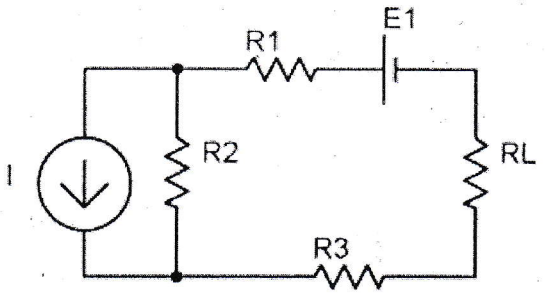
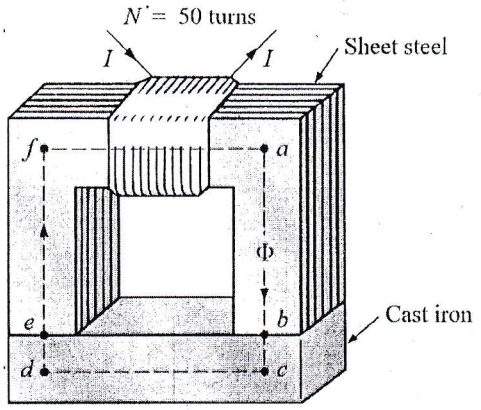


Fig: 7

5. a) Explain the equivalent Ohm's law of Magnetic Circuit. 2
   b) Explain Hysteresis curve with proper figure. 4
   c) For the electromagnet of Fig. 8, Determine the current I required to establish the indicated flux in the core. 4



$l_{ab} = l_{cd} = l_{ef} = l_{fa} = 4$ in.
$l_{bc} = l_{de} = 0.5$ in.
Area (throughout) = 1 in.^{2}
$\Phi = 3.5 \times 10^{-4}$ Wb

Fig. 8

6. a) Point out why First order circuits are named so. 2
   b) Derive expression for voltage of a Source Free RL circuit. 4
   c) The switch in Fig. 9 has been in position A for a long time. At t = 0 the switch moves to position B. Determine v(t) for t>0 and calculate its value for t = 1s and t = 4s. 4

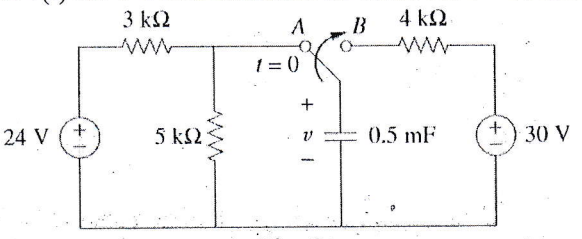


Fig. 9

7. a) Show that the energy store in an Inductor is $W = \frac{Li^2}{2}$. 3

b) Determine the current through a 200-μF capacitor whose voltage is shown in Fig. 9. 3

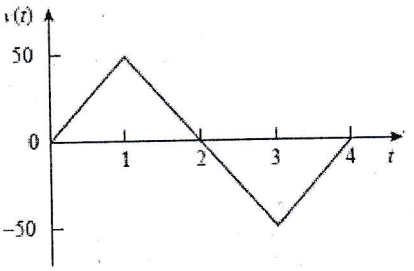


Fig: 9

c) Consider the circuit in Fig. 10 and under dc conditions, examine: 4
(a) i, v_C, and i_L,
(b) the energy stored in the capacitor and inductor.

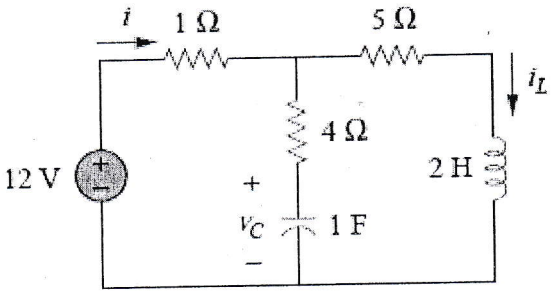
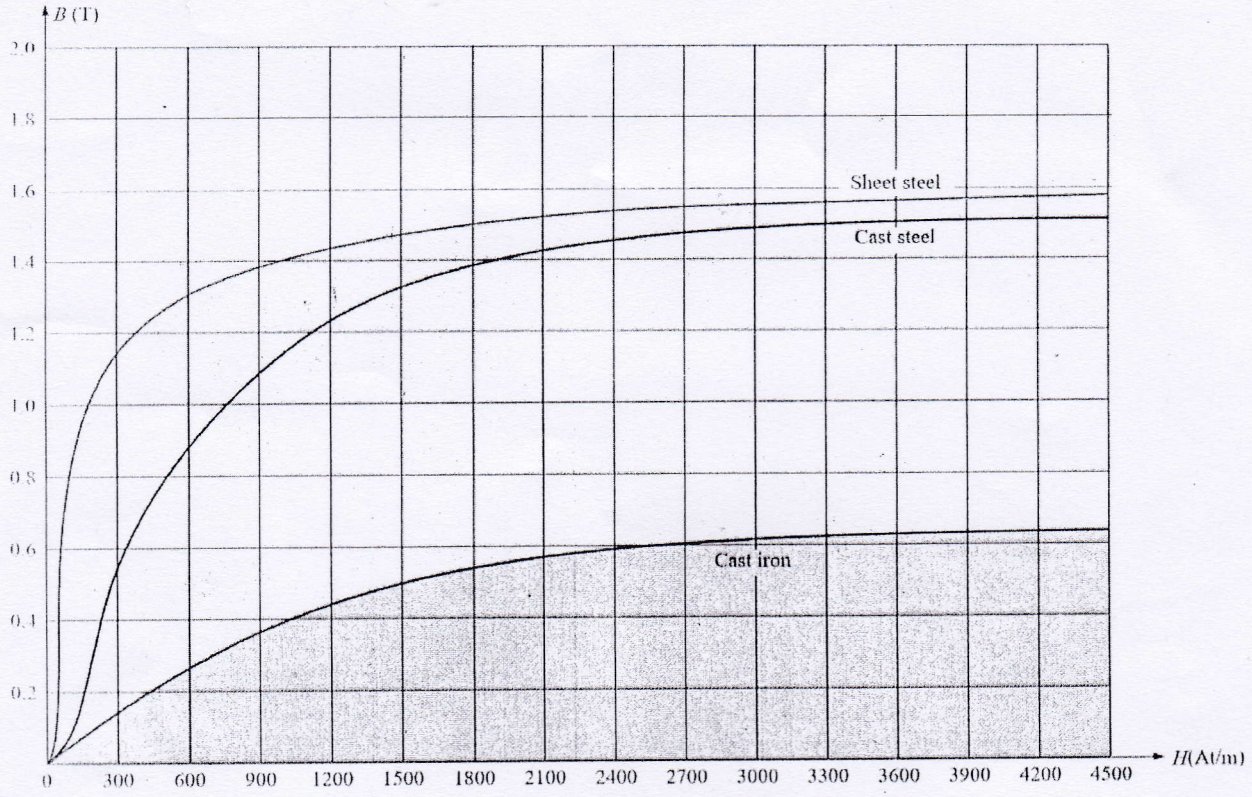
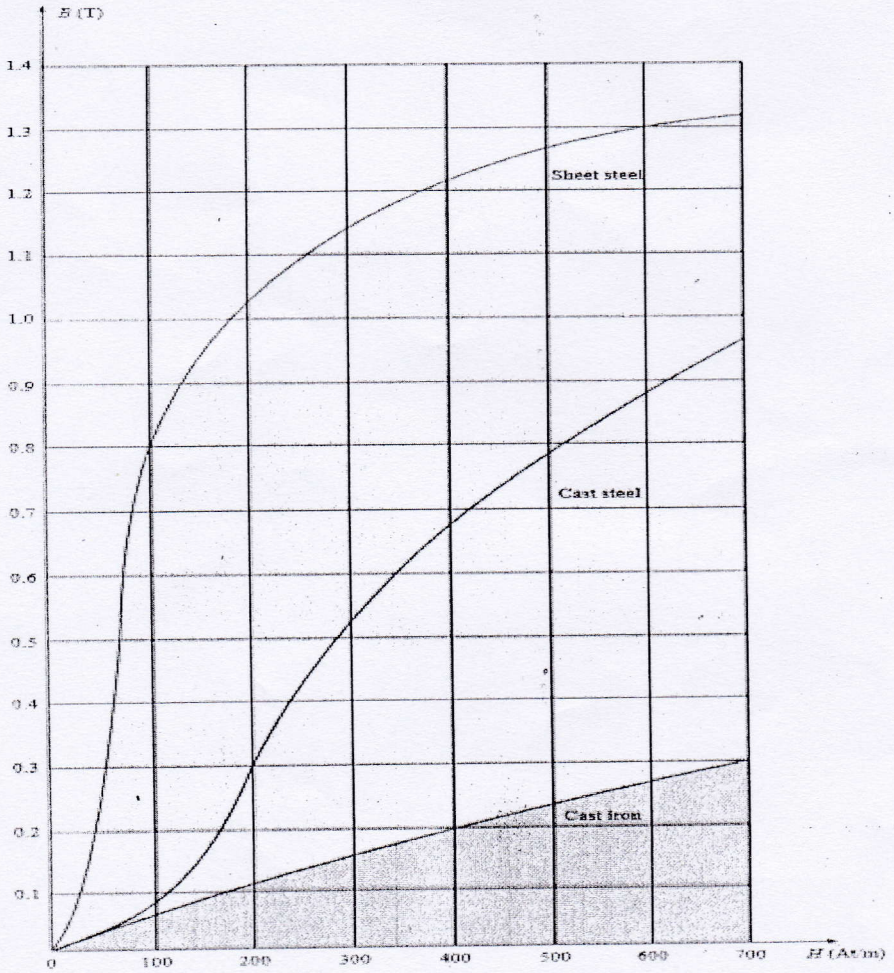


Fig: 10

Appendix


B (T)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Sheet steel
Cast steel
Cast iron
0
300
600
900
1200
1500
1800
2100
2400
2700
3000
3300
3600
3900
4200
4500
H(At/m)


B (T)
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Sheet steel
Cast steel
Cast iron
0
100
200
300
400
500
600
700
H (At/m)