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Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Final Examination, Fall – 2025

Course Code: 0713-111 | Course Title: Electrical Circuit I

Section: A, B, C, D, E, F, G, H | Level-Term: L1-T1 | Teacher's Initial: MRK, FHT

Full Marks: 40 | Exam Date: December 17, 2025 | Time: 2 Hours

[Answer all questions. Figures in the right margin indicates full marks.]

Q1. (a) **State** superposition theorem. Use superposition to **find** $\mathbf{V_x}$ in the circuit of Fig. 1. CO2 C(3) [6]

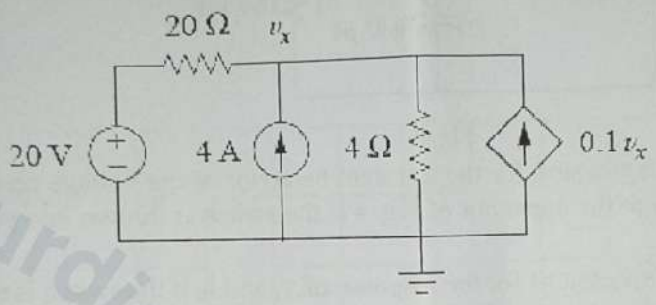


Fig.1

(b) **Find** i_o in the circuit of Fig. 2 using source transformation. CO2 C(3) [4]

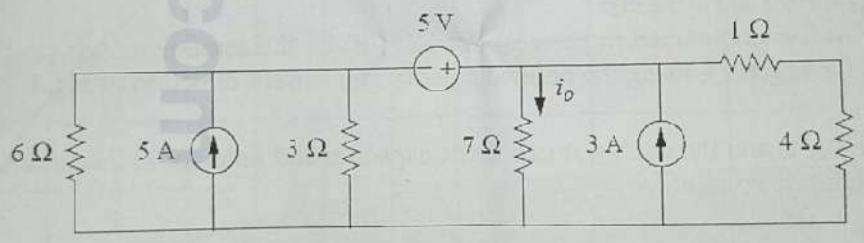


Fig. 2

Q2. (a) **State and prove** the Maximum Power Transfer Theorem for a DC circuit. CO2 C(2) [5]

(b) **Determine** the value of resistor connected across terminals a-b which will absorb maximum power from the circuit shown in Fig.3. **Determine** that power. CO2 C(3) [5]

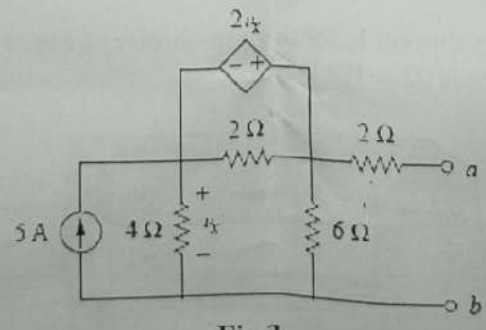


Fig.3

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Q3. **(a) Explain** the transient charging behavior of a capacitor in an RC network, and sketch the corresponding voltage and current waveforms. CO3 C(4) [4]

(b) CO3 C(4) [6]

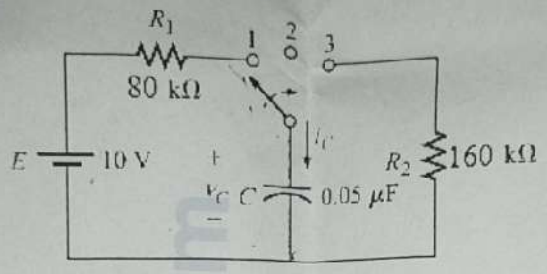


Fig. 4

i) Find the mathematical expression for the transient behavior of the voltage across the capacitor and current through the capacitor of Fig. 4 if the switch is thrown into position 1 at t = 0 s.

ii) Find the mathematical expressions for the response of $\mathbf{v_c}$ and $\mathbf{i_c}$ if the switch is thrown into position 2 at 32 ms (assuming that the leakage resistance of the capacitor is infinite ohms).

iii) Find the mathematical expressions for the voltage $\mathbf{v_c}$ and current $\mathbf{i_c}$ if the switch is thrown into position 3 at t = 52 ms.

iv) Plot the waveforms obtained in parts (i) through (iii) on the same time axis for the voltage v_c and the current i_c using the defined polarity and current direction of Fig.4.

Q4. **a) Determine** v_c, i_c and the energy stored in the capacitor and inductor in the circuit of Fig. 5 under dc conditions. [4]

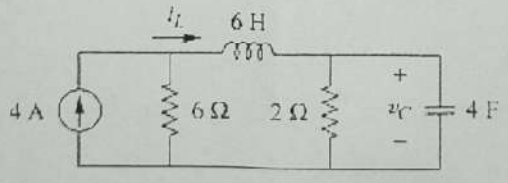


Fig. 5

b) Define the terms permeability and magnetizing force as used in magnetic circuits. [2]

c) Determine the secondary current I_2 for the transformer of Fig. 6 if the resultant clockwise flux in the core is 02×10^{-5} Wb. [4]

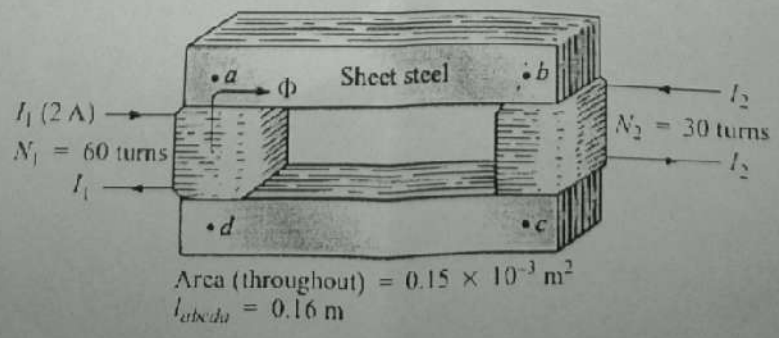


Fig.6

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B-H Curve:

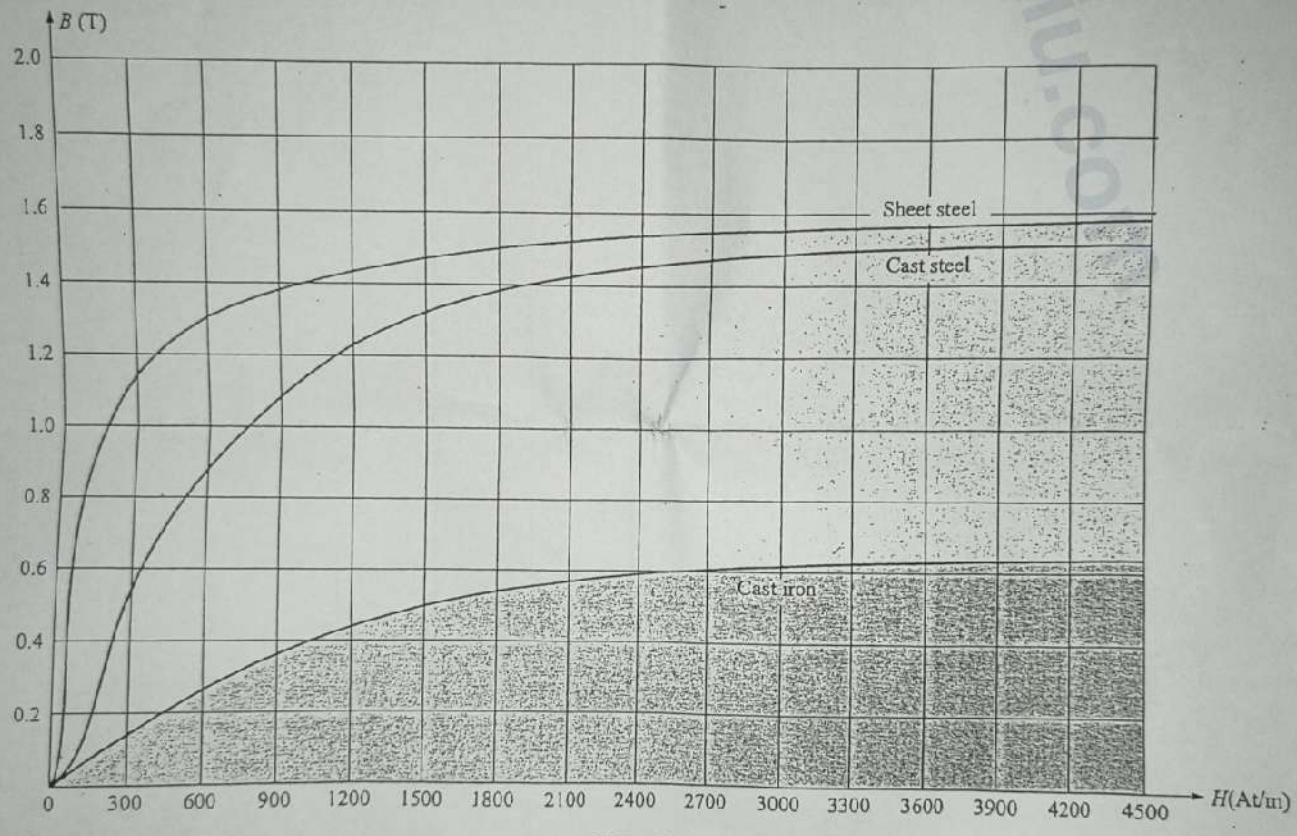


FIG.

Normal magnetization curve for three ferromagnetic materials.

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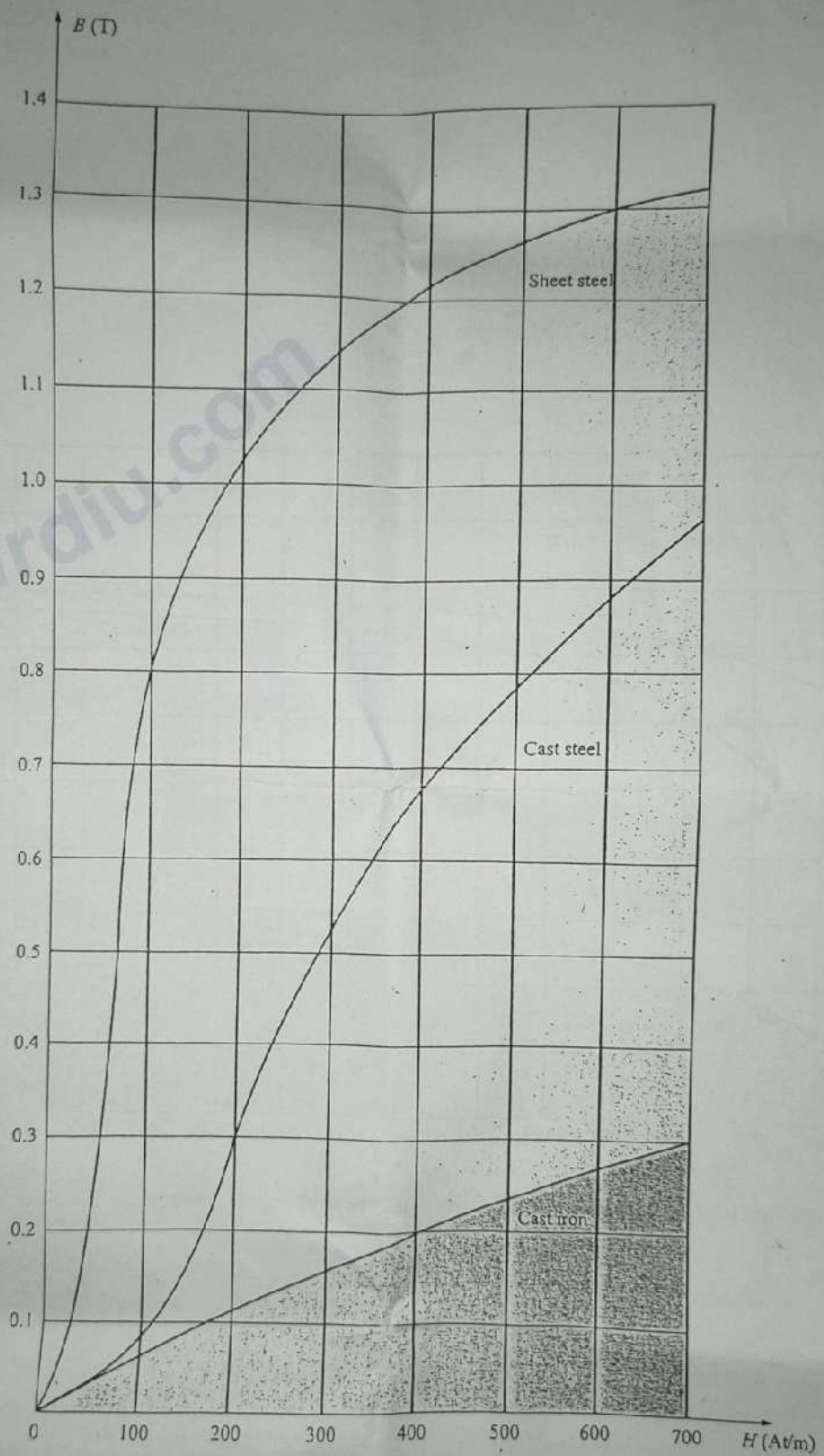


FIG.

Expanded view for the low magnetizing force region.