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 | Teacher's Initial: MRK, FHT
Section: A, B, C, D, E, F, G, H | Level-Term: L1-T1 | Time: 2 Hours
Full Marks: 40 | Exam Date: December 17, 2025

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

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

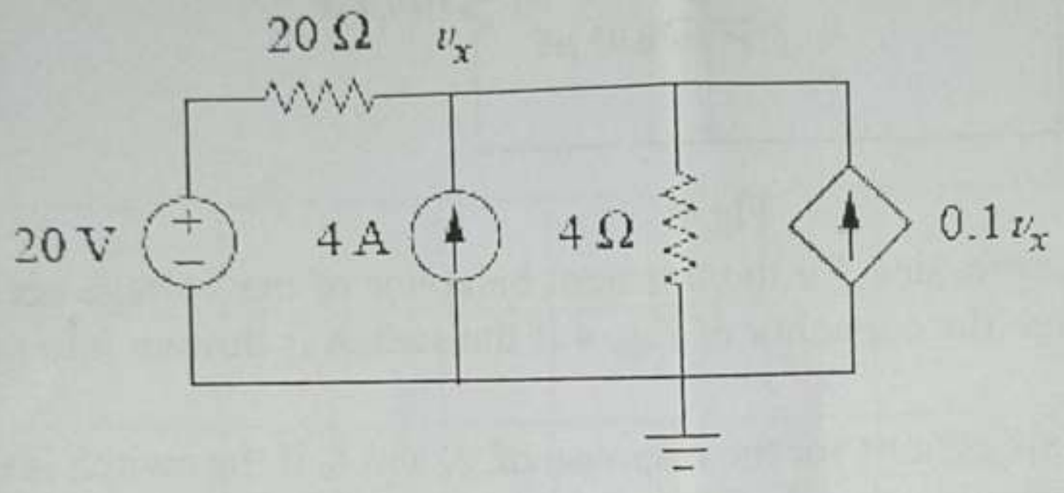

Fig.1

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

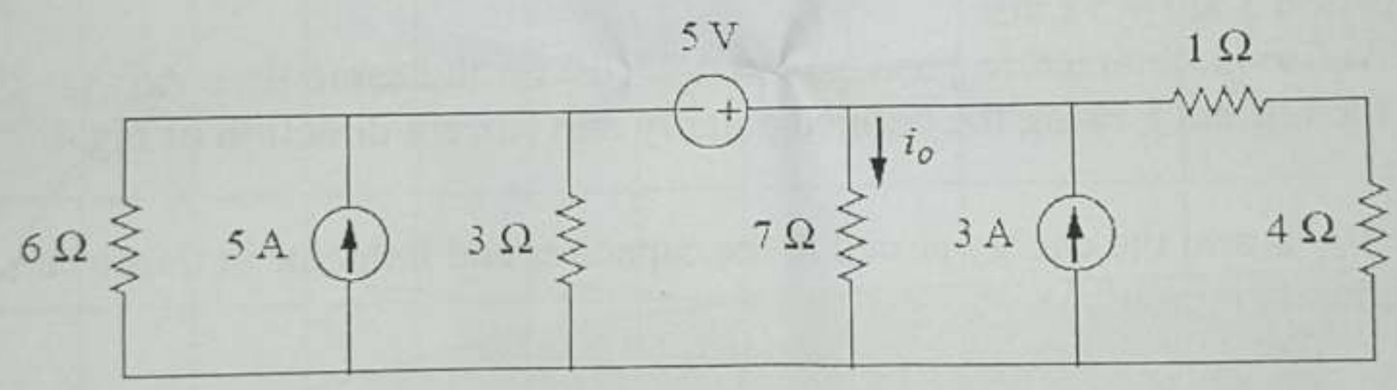

Fig. 2

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]

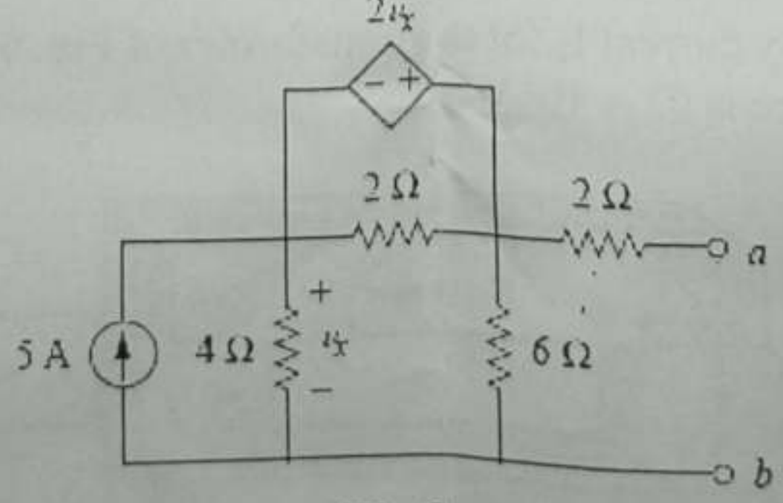

Fig.3

B-H

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]

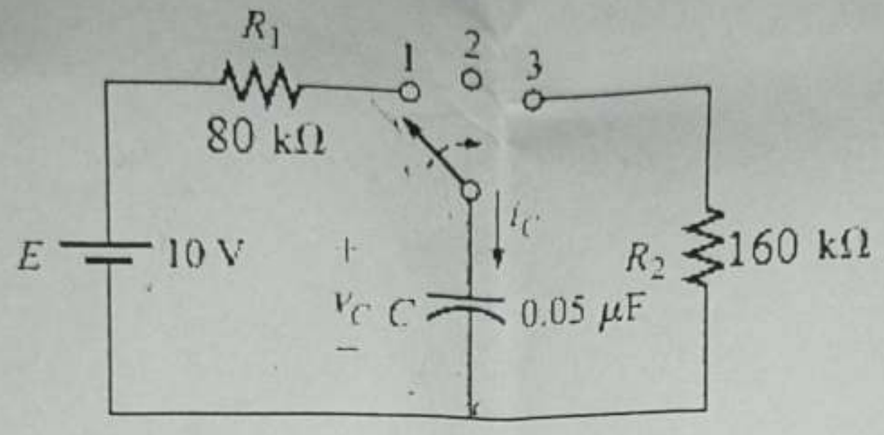

Fig. 4

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]

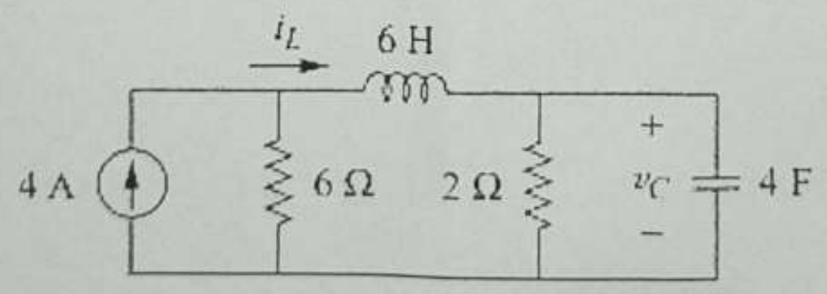

Fig. 5

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]

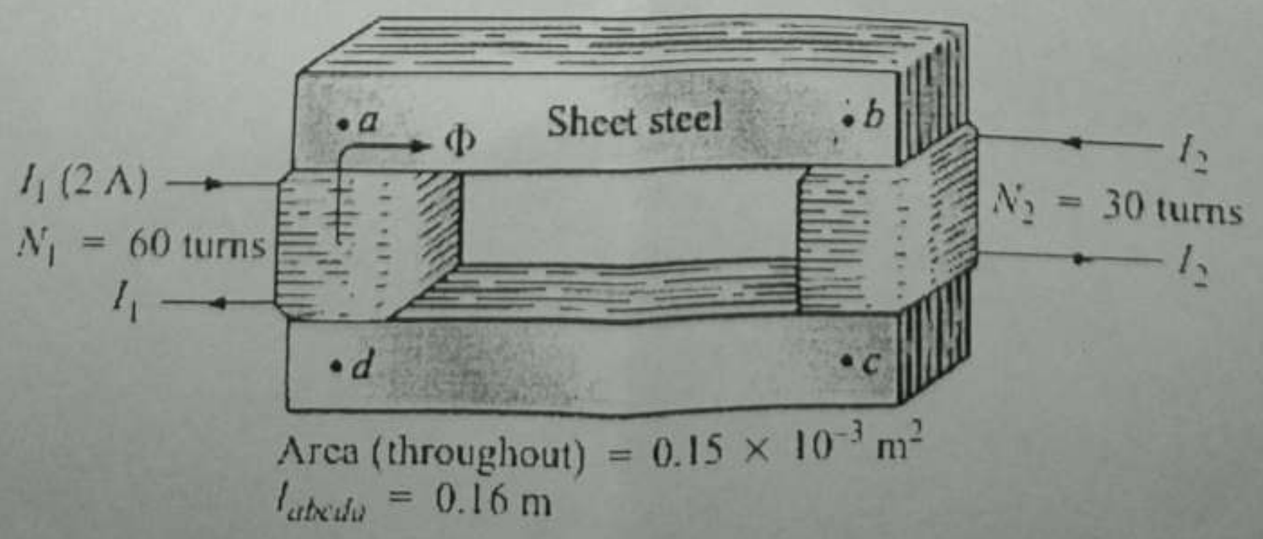

Fig.6

B-H Curve:

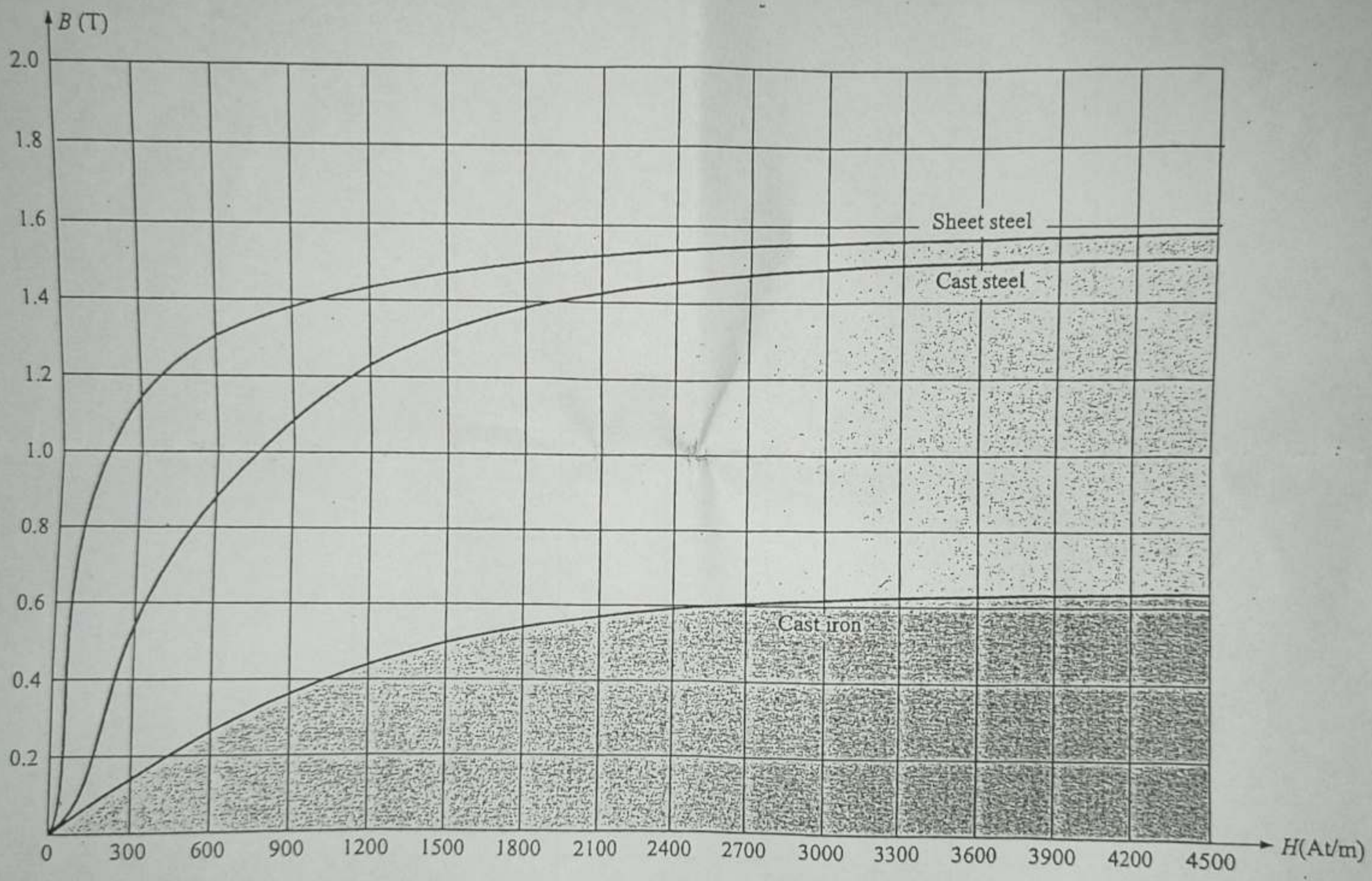

FIG.

Normal magnetization curve for three ferromagnetic materials.

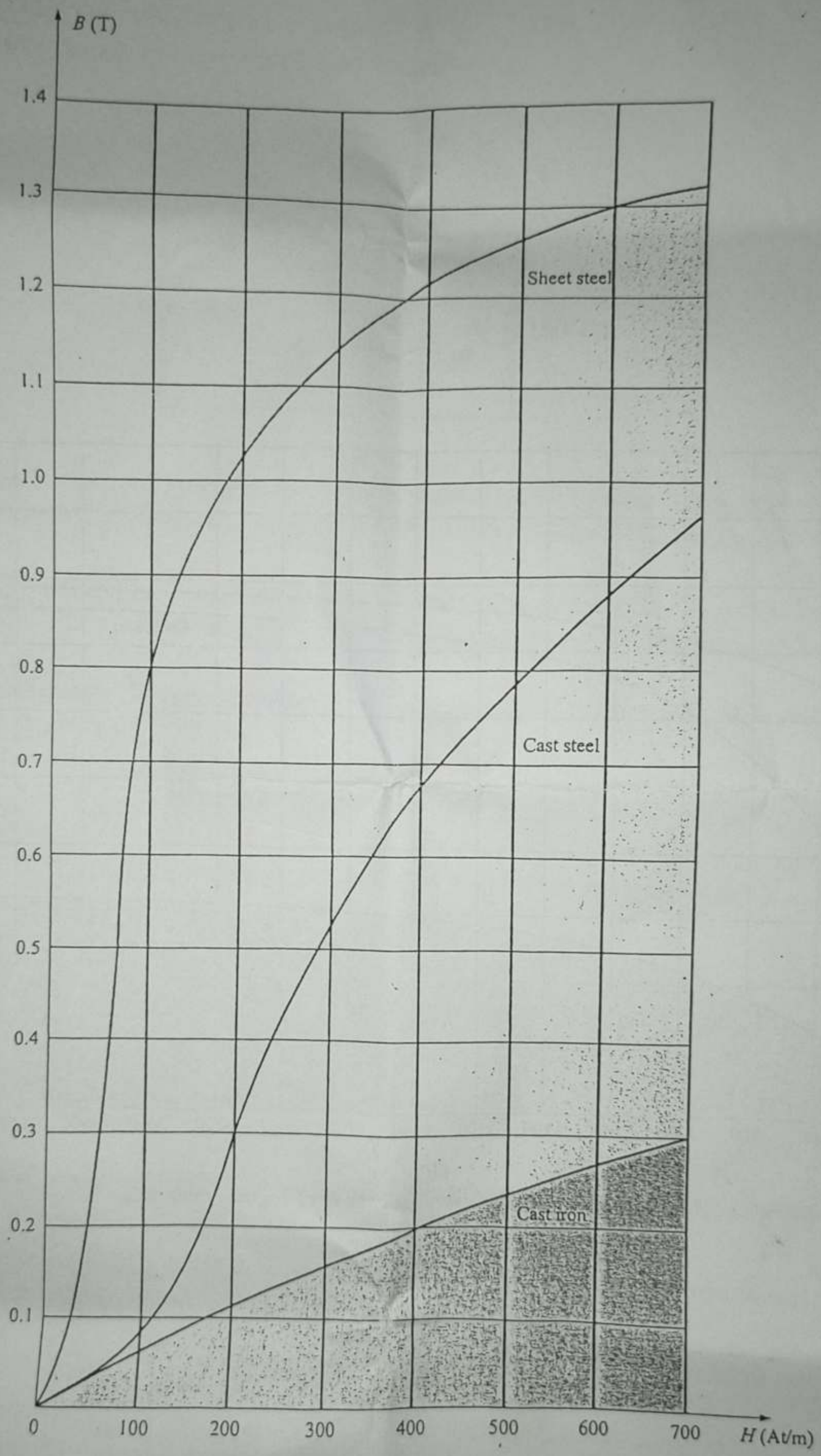

FIG.

Expanded view for the low magnetizing force region.