PRACTICE EXAM

Difficulty: MEDIUM

Questions: 10

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Electromagnetics Exam - Chapter 3
Instructions: Please answer all questions to the best of your ability.
Section 1: Multiple Choice (4 points each)
Instructions: Choose the BEST answer for each question.

**Question 1:** What is the magnetic analogue of an electric capacitor?
A) Resistor
B) Inductor
C) Diode
D) Transistor

**Question 2:** Which law allows us to relate the magnetic field H at any point in space to the current I that generates H?
A) Gauss's Law
B) Coulomb's Law
C) Biot-Savart Law
D) Ampere's Law

**Question 3:** For a toroidal coil, in which region is the magnetic field H equal to 0?
A) Only inside the core of the toroid.
B) For r < a, where 'a' is the inner radius of the toroid.
C) For r > b, where 'b' is the outer radius of the toroid.
D) Everywhere inside and outside the toroid.

**Question 4:** The normal component of which vector is continuous across the boundary between two adjacent magnetic media in the absence of surface currents?
A) H
B) D
C) E
D) B
Section 2: Short Answer (6 points each)
Instructions: Answer each question in 2-3 complete sentences.

**Question 5:** Explain the concept of magnetic flux linkage.

**Question 6:** Briefly describe how an LVDT (Linear Variable Differential Transformer) is used as an inductive sensor.

**Question 7:** What are ferromagnetic materials, and why are they used to make permanent magnets?
Section 3: Problem Solving (10 points each)

Instructions: Show all work for full credit.

**Question 8:** A long wire of radius *a* carries a steady current *I*. Using Ampere's Law, derive the magnetic field *H* at a distance *r* > *a* from the center of the wire.

**Question 9:** A solenoid with N turns has a length l and a cross-sectional area A. Derive an expression for the inductance of the solenoid.

**Question 10:** A coaxial cable has an inner conductor of radius a and an outer conductor of radius b. Determine the inductance per unit length of this cable.
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