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Electromagnetics  
Course # EC341  
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Sheet (8)

1. Obtain the expression for the self-inductance of the long solenoid of the length  $L$ , radius  $a$ , and the number of turns  $N$ . the current flowing the turns is  $I$ .
2. Obtain the expression for the self-inductance of the Toroid having the inner radius  $a$ , the outer radius  $c$ , and number of turns  $N$ . the current flowing through the turns is  $I$ .
3. Find the expression for mutual-inductance between circuit 1 having ( $N_1$  turns, current  $I_1$ ) and circuit 2 having ( $N_2$  turns, current  $I_2$ ), If the two circuits share a common Toroid (inner radius  $a$ , outer radius  $c$ ).
4. The magnetic circuit shown is made from steel with  $L_1 = L_3 = 0.3\text{m}$ ,  $L_2 = L_4 = 0.2\text{m}$ ,  $S_1 = S_2 = S_3 = S_4 = 6 \times 10^{-4} \text{ m}^2$ . and  $I = 0.05 \text{ A}$ . assume in the steel.  $H_s = 200 \text{ B}_s \text{ A/m}$   
Find:
  - a. Reluctance
  - b. Number of turns to produce  $B_s = 1 \text{ T}$  in leg 1

