Module 6: Electromagnetic Induction

Q1. In order to increase the induced current in a wire loop, we can

A increase the magnetic field strength in the loop
(True statement, but there is another correct statement)

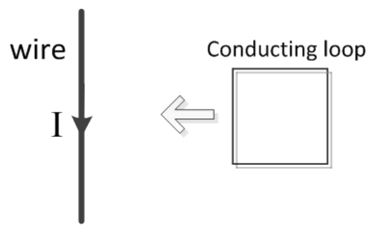
B increase the area of the loop (True statement, but there is another correct statement)

C increase the resistance of the wire (Incorrect statement, review lecture 6.1.1_Faraday's Law)

D two of the above **(BRAVO!** $\boldsymbol{I_{ind} = \frac{d(BAcos\theta)}{dt\,R}}$ **)**

E all of the above (Incorrect, review lecture 6.1.1_Faraday's Law)

Q2. A square conducting loop lies in the same plane as a long straight wire carrying a constant current. While the loop is pushed towards the wire, the direction of the induced current in the square loop is

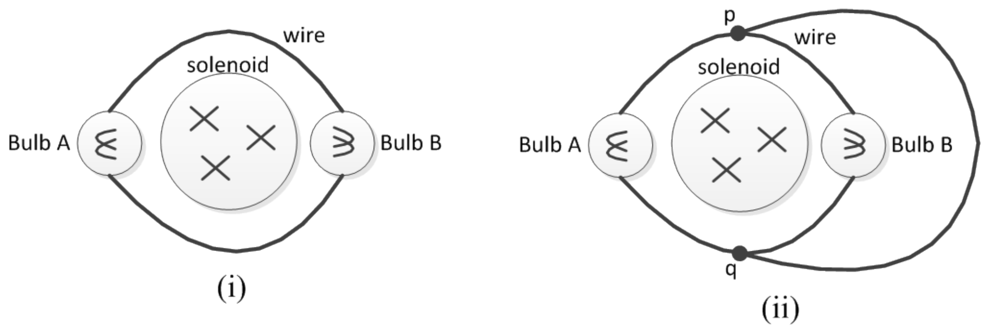


A in the clockwise direction **(BRAVO! induced emf** $= -\frac{d\varphi}{dt}$ **, magnetic flux is increasing, pointing out of the page)**

B in the counter clockwise direction (Incorrect, review lecture 6.1.1_Faraday's Law)

C hard to tell (Incorrect, review lecture 6.1.1_Faraday's Law)

Q3. A magnetic field increasing in strength pointed into the page is produced by a solenoid. An induced emf is established in a conducting wire loop connected to two light bulbs, A and B. Both bulbs light up in figure (i). Points, p and q in figure (ii) are shorted with a wire. Select the correct observation regarding figure (ii).



A both bulbs light up as in figure (i).

B bulb A goes out while bulb B gets dimmer.

C bulb A goes out while bulb B gets brighter.

D bulb B goes out while bulb A gets dimmer.

E bulb B goes out while bulb A gets brighter. **(BRAVO! for bulb B zero magnetic flux, for bulb A same flux as in figure (i) but less resistance in the wire.)**

F both bulbs go out.

A,B,C,D,F prompt: (Incorrect, review lecture 6.1.1_Faraday's Law)

Q4. The magnetic energy stored in an inductor is

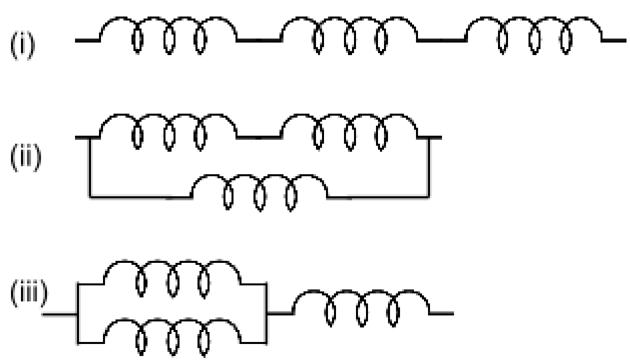
A proportional to the square of the current through the inductor
(True statement, but there is another correct statement)

B proportional to the square of the magnetic field of the inductor
(True statement, but there is another correct statement)

C neither A nor B
(Incorrect, review lectures 5.4.2_Ampere's Law-Solenoid & 6.3.1_Inductor-Stored Energy)

D both A and B **(BRAVO!** $\boldsymbol{U = \frac{1}{2}LI^2, B = \mu_0 ni}$ **)**

Q5. Which combination yields the maximum equivalent inductance, assuming all inductors have the same inductance L?



A the equivalent inductance is the same in all configurations

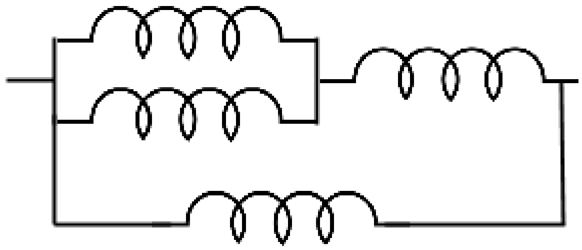
B (i) **(BRAVO! Inductors in series:** $\boldsymbol{L_{equivalent} = \Sigma L}$ **and in parallel:** $\boldsymbol{L_{equivalent} = \left[\Sigma(\frac{1}{L})\right]^{-1}}$ **)**

C (ii)

D (iii)

A,C,D prompt: (Incorrect, review lecture 6.3.2_Inductive Network)

Q6. Assuming all inductors have the same inductance L, the total inductance of this arrangement is:



A 4 L

B 5/2 L

C 5/3 L

D 3/5 L **(BRAVO! Inductors in series: $L_{equivalent} = \Sigma L$ and in parallel: $L_{equivalent} = \left[\Sigma\left(\frac{1}{L}\right)\right]^{-1}$)**

A,B,C prompt: (Incorrect, review lecture 6.3.2_Inductive Network)