Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (First year)

Subject: Physics

Paper Code: PYC -101

Paper Title: Mathematical Methods & Mechanics and Electrical Circuit Theory

Unit: 02

Module Name: Coefficient of coupling

Module No: 17

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Glossary of terms / words:

- A: Coil
- B: Coil
- N_1: Number of turns in coil A
- N_2: Number of turns in coil B
- L_1: Coefficients of self-induction of coil A
- L_2: Coefficients of self-induction of coil B
- M: Coefficient of mutual inductance
- π: Pi
- μ_o: Magnetic permeability of free space
- μ_r: Magnetic permeability of relative medium
- φ_1: Flux through coil A
- φ_2: Flux through coil B
- I_1: Current through coil A
- I_2: Current through coil B
- k: Coefficient of coupling

Possible misconception / clarification: NIL

Case Studies and Additional Examples / Illustration:

1. Two coils A and B of 12,500 turns and 16,000 turns respectively, lie in parallel planes so that 60% of flux produced in coil A links coil B. It is found that a current of 5A in A produces a flux of 0.6 mWb while the same current in B produces 0.8 mWb. Determine coefficient of coupling k.

Solution:

Flux linked with B = $\frac{0.6 \times 10^{-3} \times 0.6}{5}$

= 0.072 mWb

Mutual inductance M = $0.072 \times 10^{-3} \times 16000$

= 1.15 H

$$L_1 = \frac{12500 \times 0.6 \times 10^{-3}}{5} = 1.5 \text{ H}$$

$$L_2 = \frac{16000 \times 0.8 \times 10^{-3}}{5} = 2.56 \text{ H}$$

$$k = \frac{M}{\sqrt{L_1 L_2}}$$

$$k = \frac{1.15}{\sqrt{1.5 \times 2.56}}$$

= 0.586