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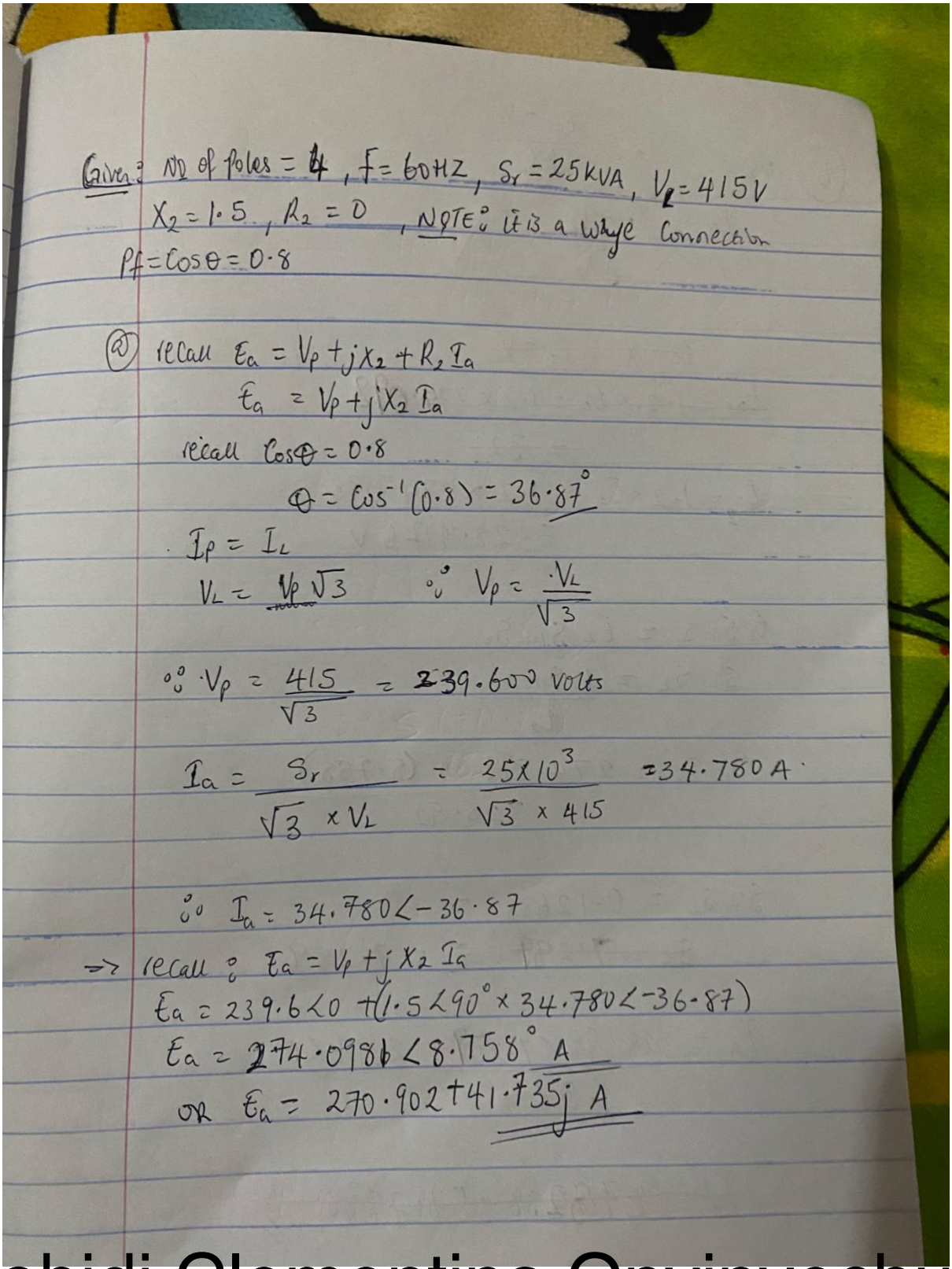
17/eng04/027



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17/ENG04/027
Electrical engineering
Electrical machines

(6) using: $I_a = \frac{E_a - V_2}{jX_2}$

$\frac{I_a}{1 \angle} = \frac{E_a - V_2}{jX_2}$

~~$I_a j X_2 = E_a - V_2$~~

~~$E_{a_1} = 1.2 \times E_a = 1.2 \times 274.098$~~

~~$= 32$~~

$\Rightarrow E_{a_2} = 1.2 \times E_a = 1.2 \times 274.098$

$= 328.9176\ V$

$E_1 \sin S_1 = E_2 \sin S_2$

$\sin S_2 = \frac{E_1 \sin S_1}{E_2}$

$\sin S_2 = \frac{274.098 \sin(8.758)}{328.92}$

$\sin S_2 = 0.12688$

~~$S_2 = 7.288$~~ $S_2 = 7.289$

$I_A = \frac{328.92 \angle 7.289 - 239.6 \angle 0}{1.5 \angle 90^\circ}$

~~$I_a = 27.8288 - 57.7838j\ A$~~

~~$I_a = 64.102 \angle -64.348^\circ$ A~~

$I_a = 27.8209 - 57.7746j$ A

$I_a = 64.1242 \angle -64.287^\circ$ A

(c) $I_a = \dfrac{E_{a2} - V}{jX_2}$

$I_a = \dfrac{274.0981 \angle 90^\circ - 239.600}{(X \cdot 5 \angle 90^\circ)}$

~~$I_a = 1.64.73 + j15$~~

$I_a = 242.705 \angle 41.157^\circ$ A

$I_a = 182.734 + 159.7301j$ A

$Pf = \cos\theta$

$Pf = \cos(41.157)$

$Pf = 0.7529$

reactive power, $Q = \sqrt{3} \times V_L \times I_L \times \sin\theta$

$= 7.289 \times 415 \times 242.705 \times \sin(41.157)$

$= 483173.2593$

$Q = \sqrt{3} \times 415 \times 242.705 \times \sin(41.157)$

$= 114814.1904$ Watt