

MATRIC NO: 17/ENG06/089

DEPARTMENT: MECHANICAL ENGINEERING

LEVEL: 800 LEVEL

i $V = 415V$

Output = 74.6 kW

P.F = 0.7

Lagging with efficiency of 85%

$f = 50\text{Hz}$

ii To raise P.F to unity

Current angle has to be reduced to 0°

at P.F = 0.7

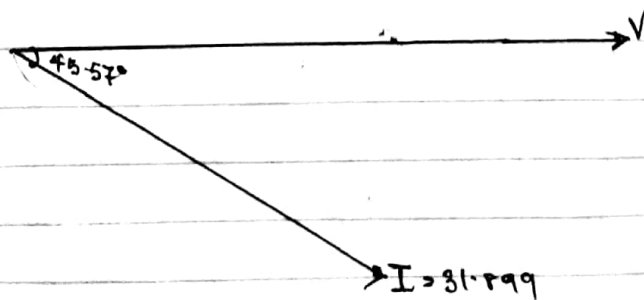
Current angle = $\cos^{-1} 0.7$
 $= 45.57^\circ$

$I > (0.7 \times 45.57) < 45.57$

$I = 31.899 < 45.57^\circ$

iii at 0.9 lagging

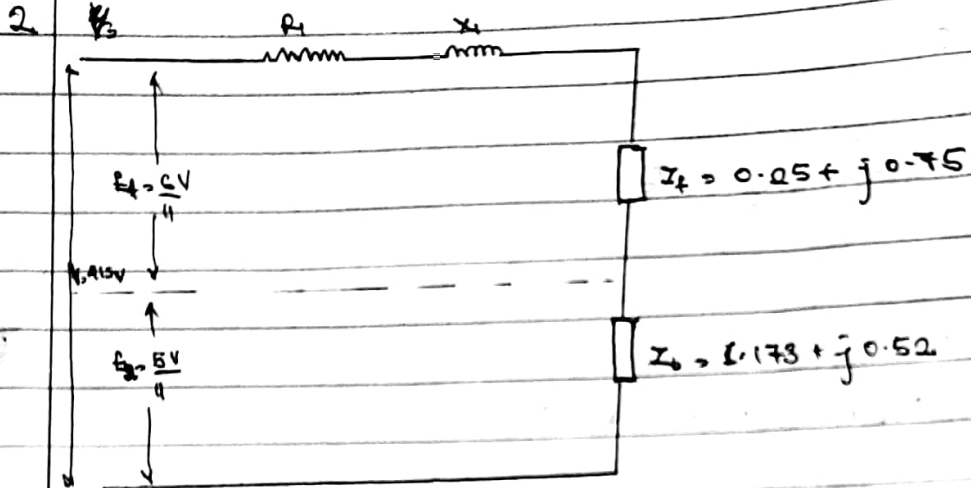
if lagging with efficiency of 90%



MATRIC NO: (7/ENG06/039

DEPARTMENT: MECHANICAL ENGINEERING

LEVEL: 300 LEVEL



b $V_2 = 15V$

$E_1 = 5V$

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$E_2 = 5 \times 15$

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$E_2 = 188.64V$

$Z_2 = 1.173 + j0.52$

$I_2 = \frac{188.64}{1.173 + j0.52}$

$I_2 = 134.40 - j59.58 A$

$\approx 147.01 \angle -23.91 A$

MATRIC NO: 17/E0906/039

DEPARTMENT: MECHANICAL ENGINEERING

LEVEL: 300 LEVEL

3a $N_s = \frac{120P}{P}$

$R = 50 \Omega$

$R = 15 \Omega$

$X = 0.25 \text{ H}$

P = 6 poles

$N_s = \frac{120 \times 50}{6}$

$N_s = 1000 \text{ rpm}$

b $V = 220 \text{ V}$

$R = 15 \Omega$

$X = 0.25 \text{ H}$

$Z = 15 + j0.25$

$I = \frac{220}{15 + j0.25}$

$I = 14.66 - j0.24$

$I = 14.66 \angle -0.94$

P.F. = $\cos \theta$

$= \cos 0.94$

$= 0.9999$

P.F. = 0.9999

c $\text{Slip} = \frac{N_s - N_r}{N_s}$

Slip =