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%% ECE412 HW 5
%% Hyongmeen Baik

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hc = 30e-3
hw = 20e-3
d = 3.183e-3
w0 = 12e-3
w1 = 12e-3
w2 = 6e-3
ur = 1000
u0 = 4*pi*(1e-7);
A1 = w0*d;
A2 = (hc-hw)/2*d;
A3 = w2*d;
A4 = A2;
l1 = (hc+hw)/2
l2 = (w0+w1+w2+w1)/2
l3 = l1
l4 = l2

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R1 = l1/u0/ur/A1
R2 = l2/u0/ur/A2
R3 = l3/u0/ur/A3
R4 = l4/u0/ur/A4

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Rtot = R1+R2+R3+R4

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i1 = 0.2
i2 = 0.15
N1 = 150
N2 = 300

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flux = (i1*N1+i2*N2)/Rtot

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fluxlinkage1 = flux*N1
fluxlinkage2 = flux*N2

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B1= flux/A1
B3 = flux/A3

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%% q3
f = 150
Lm = N1*N1/Rtot

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V1_ph = 1
R = 5

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Ip_ph = 4*1/R
Im_ph = V1_ph/(j*2*pi*f*Lm)

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I1_ph = Ip_ph + Im_ph;
I1 = abs(I1_ph);

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%% Q4
clc
clear

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B_max = 0.1
Jm = 3.5e6
Kw = 0.38
P = 1500
Fs = 100e3
Vp = 125
Ap = P/2/Fs/B_max/Kw/Jm

A = 43
B = 21
C = 20
D = 14.8
E = 29.5
F = 12.2
L = 6.75
M = 8.65

Ac = F*C
Aw = M*2*D
App = Ac*Aw

Ac = Ac*1e-6
Np_min = Vp/4/Fs/Ac/B_max
Ns_min = 2*Np_min

ip_peak = 12
is_peak = 6
Awp_min = ip_peak/Jm
Aws_min = is_peak/Jm
```