

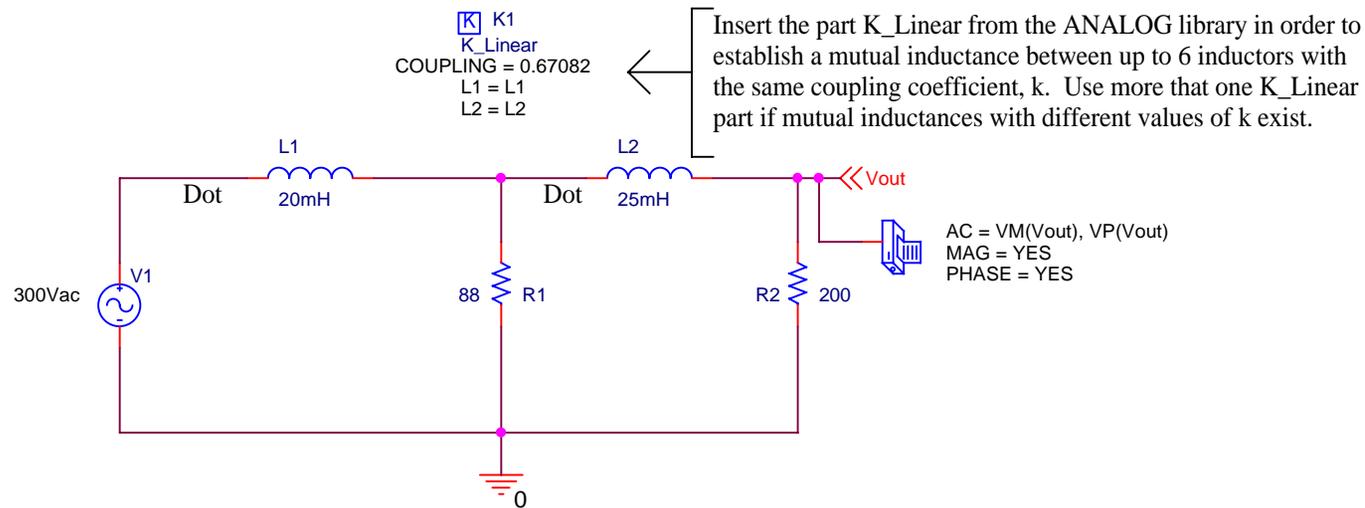
Mutual Inductance

Purpose: Find the average power delivered to the 200 ohm resistor in the circuit shown below if the source is $424\cos(8000t)$ V. A mutual inductance of $M = 15\text{mH}$ occurs between the inductors. This is problem 12.13 from Electric Circuits, 5th Ed by Nilsson.

Analysis: Use an AC Sweep with a single frequency of $8000/(2\pi) = 1273$ Hz

Solve for the coupling coefficient: $k = M/\sqrt{L1*L2} = 0.67082$

Find the power to the 200 ohm resistor using $V(Vout)*V(Vout)/200$.



Note that the peak source voltage is 424V so the RMS voltage is 300V.

Inductors rotate around the positive (dotted) terminal. The text "Dot" was added next to each inductor as a visual indicator of the dot location.

Edit attributes of parts as follows:

- 1) If the attribute appears next to the part, double click it and then change its value
- 2) If the attribute does not appear next to the part, double click on the part, find the desired attribute, right click on it and select DISPLAY. Then indicate what Display Format is desired. Once the attribute has been displayed, double-click on it and change the value.

Title		
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Size	Document Number	Rev
A	<Doc>	<RevCode>
Date:	Wednesday, January 26, 2000	Sheet 1 of 1

**** 01/26/00 19:14:36 ***** Evaluation PSpice (Mar 1999) *****

** circuit file for profile: AC Sweep

**** CIRCUIT DESCRIPTION

** WARNING: THIS AUTOMATICALLY GENERATED FILE MAY BE OVERWRITTEN BY SUBSEQUENT PROFILES

*Libraries:

* Local Libraries :

* From [PSPICE NETLIST] section of pspiceev.ini file:

.lib nom.lib

*Analysis directives:

.AC LIN 1 1273Hz 1273Hz

.PROBE

.INC "mutual inductance-SCHEMATIC1.net"

**** INCLUDING "mutual inductance-SCHEMATIC1.net" ****

* source MUTUAL INDUCTANCE

R_R1 0 N02154 88

R_R2 0 VOUT 200

.PRINT AC

+ VM([VOUT])

+ VP([VOUT])

Kn_K1 L_L1 L_L2 0.67082

V_V1 N00023 0 DC 0Vdc AC 300Vac

L_L1 N00023 N02154 20mH

L_L2 N02154 VOUT 25mH

**** RESUMING "mutual inductance-SCHEMATIC1-AC Sweep.sim.cir" ****

.INC "mutual inductance-SCHEMATIC1.als"

**** INCLUDING "mutual inductance-SCHEMATIC1.als" ****

.ALIASES

R_R1 R1(1=0 2=N02154)

R_R2 R2(1=0 2=VOUT)

Kn_K1 K1()

V_V1 V1(+=N00023 -=0)

L_L1 L1(1=N00023 2=N02154)

L_L2 L2(1=N02154 2=VOUT)

_(Vout=VOUT)

.ENDALIASES

**** RESUMING "mutual inductance-SCHEMATIC1-AC Sweep.sim.cir" ****

.END

**** 01/26/00 19:14:36 ***** Evaluation PSpice (Mar 1999) *****

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**** SMALL SIGNAL BIAS SOLUTION TEMPERATURE = 27.000 DEG C

NODE	VOLTAGE	NODE	VOLTAGE	NODE	VOLTAGE	NODE	VOLTAGE
(VOUT)	0.0000	(N00023)	0.0000	(N02154)	0.0000		

VOLTAGE SOURCE CURRENTS
NAME CURRENT

V_V1 0.000E+00

TOTAL POWER DISSIPATION 0.00E+00 WATTS

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**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ	VM(VOUT)	VP(VOUT)
1.273E+03	1.053E+02	-1.437E+02

$$\boxed{\text{So } V_{\text{out}} = 105.3 / -143.7^\circ \text{ V}}$$

JOB CONCLUDED

$$\boxed{\text{And } P = (105.3)^2 / 200 = 55.4 \text{ W}}$$

TOTAL JOB TIME .30

