EGR 272 Circuit Theory II File: Mutual Inductance.opj

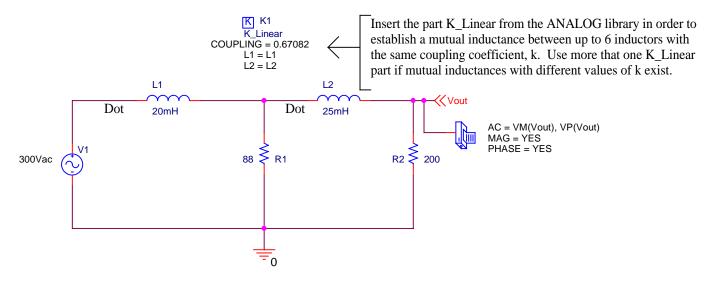
Mutual Inductance

Purpose: Find the average power delivered to the 200 ohm resistor in the circuit shown below if the source is 424cos(8000t) V. A mutual inductance of M = 15 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/(2Pi) = 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.

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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.

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** 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 0 VOUT 200 r_r2 .PRINT AC + VM([VOUT]) + VP([VOUT]) Kn_Kl L_L1 L_L2 0.67082 N00023 0 DC 0Vdc AC 300Vac V_V1 N00023 N02154 20mH L_L1 L_L2 N02154 VOUT 25mH **** RESUMING "mutual inductance-SCHEMATIC1-AC Sweep.sim.cir" **** .INC "mutual inductance-SCHEMATIC1.als" **** INCLUDING "mutual inductance-SCHEMATIC1.als" **** .ALIASES R1(1=0 2=N02154) R R1 R2(1=0 2=VOUT) R_R2 Kn_Kl K1() V_V1 V1(+=N00023 -=0) L_{L1} L1(1=N00023 2=N02154) L2(1=N02154 2=VOUT) L_L2 _ _(Vout=VOUT) .ENDALIASES **** RESUMING "mutual inductance-SCHEMATIC1-AC Sweep.sim.cir" **** .END

** circuit file for profile: AC Sweep * * * * 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 ** circuit file for profile: AC Sweep * * * * AC ANALYSIS TEMPERATURE = 27.000 DEG C FREQ VM(VOUT) VP(VOUT) 1.273E+03 1.053E+02 -1.437E+02 So V_{out} = 105.3/-143.7° V And P = $(105.3)^2/200 = 55.4$ W JOB CONCLUDED TOTAL JOB TIME .30

Simulation Settings - AC Sweep				×
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