

OK

BREAK: HHH

;OS

LIST

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100 REM
110 REM
120 REM      *****CNAF***** CNAF *****CNAF*****
130 REM
140 REM
150 REM
160 REM      MATRIX SOLUTION BY H-P FOR THE 983617 RE. WRITTEN
170 REM      BY DEANE JENSEN. MODIFIED FOR MICROSOFT BY GERT
180 REM      MASSENDURG AND ROB ROBINET. FALL 1978
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190 REM      REQUIRES 9 DIGIT FLOATING POINT AND >16K MEMORY
210 REM
220 REM      FOR CLARITY ALL CONSTANTS ARE SHOWN IN RAW NUMERIC
230 REM      FORM. HOWEVER, A SIGNIFICANT SPEED ADVANTAGE IS
240 REM      GAINED WITH MICROSOFT WHEN CONSTANTS ARE REPRESENTED BY
250 REM      VARIABLES. THIS IS AN ADVANTAGE IN RUNNING THE MATRIX.
260 REM      FOR INSTANCE, IN LINES 2590 & 2600 REPLACE THE '2' WITH
270 REM      A VARIABLE 'TU' WHICH HAS BEEN SET IN INITIALIZATION 'TU=2'.
280 REM
290 REM      NOTE USE OF <.00001> FACTOR TO CORRECT MICROSOFT
300 REM      BINARY ROUND-OFF ERROR!!!
310 REM
320 REM      TO SAVE SPACE ELIMINATE REM'S TO LINE 99. DO NOT
330 REM      DROP REM'S IN PROGRAM AS THEY ARE OFTEN RECEIVERS
340 REM      FOR GOTO STATEMENTS
350 REM
360 REM      UPDATED & RENUMBERED 02/11/81 - GYM
370 REM
380 REM INITIALIZATION
390 LN=LOG(100)
400 R1=0:N1=0:C1=1:Y1=1:N2=2:S1=3:N3=4
410 PI=3.14159266
420 INPUT "# OF NODES"; N4
430 C2=5*N4
440 DIM Y(N4,N4), Z(N4,N4), C(2*C2)
450 O1=N4
460 IF N4=2 GOTO 510
470 PRINT "OUTPUT NODE 2 OR"; O1;
480 INPUT O1
490 IF O1=2 THEN O2=Y1
500 IF O1<>2 AND O1<>N4 THEN O1=N4
510 PRINT "INPUT IS NODE 1 OUTPUT IS NODE"; O1; " GROUND IS NODE 0"
520 REM * FIRST COMPONENT
530 C3=0
540 REM * NEXT COMPONENT
550 ON C3+1 GOTO 560, 590, 620, 650, 1310
560 C$="RESISTOR (OHMS)"
570 E1=0
580 GOTO 680
590 C$="CAPACITOR (MFDD)"
600 E1=6

610 GOTO 680
620 C$="INDUCTOR (HYD)"
630 E1=0
640 GOTO 680
650 C$="SOURCE (MHO)"
660 E1=0
670 REM '<>' IS USED TO SAVE OLD VALUE. USE ANY CONVENIENT SYMBOL
680 PRINT C$; INPUT "ENTER NEW VALUE FOR '<'"; V1$
690 IF V1$=<0> GOTO 750
700 V1=VAL(V1$)
710 IF V1<0 THEN : PRINT "ERROR! "; : GOTO 680
    20 IF V1>0 GOTO 750
720 IF V1=0 THEN C3=C3+1
730 GOTO 540
750 REM * STORE VALUE
760 N(C3+1)=N(C3+1)+1
770 C(2*N(C3+1))=V1/C1*R(E1)
780 N(C3+1)=1

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7900 REM *** 1160=0, 1170=1, 1180=2, 1190=3, 1200=4, 1210=5, 1220=6, 1230=7, 1240=8, 1250=9, 1260=N1, 1270=N2, 1280=N3, 1290=N4, 1300=N5, 1310=N6, 1320=N7, 1330=N8, 1340=N9, 1350=N10, 1360=N11, 1370=N12, 1380=N13, 1390=N14, 1400=N15, 1410=N16, 1420=N17, 1430=N18, 1440=N19, 1450=N20, 1460=N21, 1470=N22, 1480=N23, 1490=N24, 1500=N25, 1510=N26, 1520=N27, 1530=N28, 1540=N29, 1550=N30, 1560=N31, 1570=N32, 1580=N33, 1590=N34, 1600=N35, 1610=N36, 1620=N37, 1630=N38, 1640=N39, 1650=N40, 1660=N41, 1670=N42, 1680=N43, 1690=N44, 1700=N45, 1710=N46, 1720=N47, 1730=N48, 1740=N49, 1750=N50, 1760=N51, 1770=N52, 1780=N53, 1790=N54, 1800=N55, 1810=N56, 1820=N57, 1830=N58, 1840=N59, 1850=N60, 1860=N61, 1870=N62, 1880=N63, 1890=N64, 1900=N65, 1910=N66, 1920=N67, 1930=N68, 1940=N69, 1950=N70, 1960=N71, 1970=N72, 1980=N73, 1990=N74, 2000=N75, 2010=N76, 2020=N77, 2030=N78, 2040=N79, 2050=N7A, 2060=N7B, 2070=N7C, 2080=N7D, 2090=N7E, 2100=N7F, 2110=N7G, 2120=N7H, 2130=N7I, 2140=N7J, 2150=N7K, 2160=N7L, 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8350=N7K, 8355=N7L, 8360=N7M, 8365=N7N, 8370=N7O, 8375=N7P, 8380=N7Q, 8385=N7R, 8390=N7S, 8395=N7T, 8400=N7U, 8405=N7V, 8410=N7W, 8415=N7X, 8420=N7Y, 8425=N7Z, 8430=N7A, 8435=N7B, 8440=N7C, 8445=N7D, 8450=N7E, 8455=N7F, 8460=N7G, 8465=N7H, 8470=N7I, 8475=N7J, 8480=N7K, 8485=N7L, 8490=N7M, 8495=N7N, 8500=N7O, 8505=N7P, 8510=N7Q, 8515=N7R, 8520=N7S, 8525=N7T, 8530=N7U, 8535=N7V, 8540=N7W, 8545=N7X, 8550=N7Y, 8555=N7Z, 8560=N7A, 8565=N7B, 8570=N7C, 8575=N7D, 8580=N7E, 8585=N7F, 8590=N7G, 8595=N7H, 8600=N7I, 8605=N7J, 8610=N7K, 8615=N7L, 8620=N7M, 8625=N7N, 8630=N7O, 8635=N7P, 8640=N7Q, 8645=N7R, 8650=N7S, 8655=N7T, 8660=N7U, 8665=N7V, 8670=N7W, 8675=N7X, 8680=N7Y, 8685=N7Z, 8690=N7A, 8695=N7B, 8700=N7C, 8705=N7D, 8710=N7E, 8715=N7F, 8720=N7G, 8725=N7H, 8730=N7I, 8735=N7J, 8740=N7K, 8745=N7L, 8750=N7M, 8755=N7N, 8760=N7O, 8765=N7P, 8770=N7Q, 8775=N7R, 8780=N7S, 8785=N7T, 8790=N7U, 8795=N7V, 8800=N7W, 8805=N7X, 8810=N7Y, 8815=N7Z, 8820=N7A, 8825=N7B, 8830=N7C, 8835=N7D, 8840=N7E, 8845=N7F, 8850=N7G, 8855=N7H, 8860=N7I, 8865=N7J, 8870=N7K, 8875=N7L, 8880=N7M, 8885=N7N, 8890=N7O, 8895=N7P, 8900=N7Q, 8905=N7R, 8910=N7S, 8915=N7T, 8920=N7U, 8925=N7V, 8930=N7W, 8935=N7X, 8940=N7Y, 8945=N7Z, 8950=N7A, 8955=N7B, 8960=N7C, 8965=N7D, 8970=N7E, 8975=N7F, 8980=N7G, 8985=N7H, 8990=N7I, 8995=N7J, 9000=N7K, 9005=N7L, 9010=N7M, 9015=N7N, 9020=N7O, 9025=N7P, 9030=N7Q, 9035=N7R, 9040=N7S, 9045=N7T, 9050=N7U, 9055=N7V, 9060=N7W, 9065=N7X, 9070=N7Y, 9075=N7Z, 9080=N7A, 9085=N7B, 9090=N7C, 9095=N7D, 9100=N7E, 9105=N7F, 9110=N7G, 9115=N7H, 9120=N7I, 9125=N7J, 9130=N7K, 9135=N7L, 9140=N7M, 9145=N7N, 9150=N7O, 9155=N7P, 9160=N7Q, 9165=N7R, 9170=N7S, 9175=N7T, 9180=N7U, 9185=N7V, 9190=N7W, 9195=N7X, 9200=N7Y, 9205=N7Z, 9210=N7A, 9215=N7B, 9220=N7C, 9225=N7D, 9230=N7E, 9235=N7F, 9240=N7G, 9245=N7H, 9250=N7I, 9255=N7J, 9260=N7K, 9265=N7L, 9270=N7M, 9275=N7N, 9280=N7O, 9285=N7P, 9290=N7Q, 9295=N7R, 9300=N7S, 9305=N7T, 9310=N7U, 9315=N7V, 9320=N7W, 9325=N7X, 9330=N7Y, 9335=N7Z, 9340=N7A, 9345=N7B, 9350=N7C, 9355=N7D, 9360=N7E, 9365=N7F, 9370=N7G, 9375=N7H, 9380=N7I, 9385=N7J, 9390=N7K, 9395=N7L, 9400=N7M, 9405=N7N, 9410=N7O, 9415=N7P, 9420=N7Q, 9425=N7R, 9430=N7S, 9435=N7T, 9440=N7U, 9445=N7V, 9450=N7W, 9455=N7X, 9460=N7Y, 9465=N7Z, 9470=N7A, 9475=N7B, 9480=N7C, 9485=N7D, 9490=N7E, 9495=N7F, 9500=N7G, 9505=N7H, 9510=N7I, 9515=N7J, 9520=N7K, 9525=N7L, 9530=N7M, 9535=N7N, 9540=N7O, 9545=N7P, 9550=N7Q, 9555=N7R, 9560=N7S, 9565=N7T, 9570=N7U, 9575=N7V, 9580=N7W, 9585=N7X, 9590=N7Y, 9595=N7Z, 9600=N7A, 9605=N7B, 9610=N7C, 9615=N7D, 9620=N7E, 9625=N7F, 9630=N7G, 9635=N7H, 9640=N7I, 9645=N7J, 9650=N7K, 9655=N7L, 9660=N7M, 9665=N7N, 9670=N7O, 9675=N7P, 9680=N7Q, 9685=N7R, 9690=N7S, 9695=N7T, 9700=N7U, 9705=N7V, 9710=N7W, 9715=N7X, 9720=N7Y, 9725=N7Z, 9730=N7A, 9735=N7B, 9740=N7C, 9745=N7D, 9750=N7E, 9755=N7F, 9760=N7G, 9765=N7H, 9770=N7I, 9775=N7J, 9780=N7K, 9785=N7L, 9790=N7M, 9795=N7N, 9800=N7O, 9805=N7P, 9810=N7Q, 9815=N7R, 9820=N7S, 9825=N7T, 9830=N7U, 9835=N7V, 9840=N7W, 9845=N7X, 9850=N7Y, 9855=N7Z, 9860=N7A, 9865=N7B, 9870=N7C, 9875=N7D, 9880=N7E, 9885=N7F, 9890=N7G, 9895=N7H, 9900=N7I, 9905=N7J, 9910=N7K, 9915=N7L, 9920=N7M, 9925=N7N, 9930=N7O, 9935=N7P, 9940=N7Q, 9945=N7R, 9950=N7S, 9955=N7T, 9960=N7U, 9965=N7V, 9970=N7W, 9975=N7X, 9980=N7Y, 9985=N7Z, 9990=N7A, 9995=N7B, 9999=N7C, 10000=N7D, 10005=N7E, 10010=N7F, 10015=N7G, 10020=N7H, 10025=N7I, 10030=N7J, 10035=N7K, 10040=N7L, 10045=N7M, 10050=N7N, 10055=N7O, 10060=N7P, 10065=N7Q, 10070=N7R, 10075=N7S, 10080=N7T, 10085=N7U, 10090=N7V, 10095=N7W, 10100=N7X, 10105=N7Y, 10110=N7Z, 10115=N7A, 10120=N7B, 10125=N7C, 10130=N7D, 10135=N7E, 10140=N7F, 10145=N7G, 10150=N7H, 10155=N7I, 10160=N7J, 10165=N7K, 10170=N7L, 10175=N7M, 10180=N7N, 10185=N7O, 10190=N7P, 10195=N7Q, 10200=N7R, 10205=N7S, 10210=N7T, 10215=N7U, 10220=N7V, 10225=N7W, 10230=N7X, 10235=N7Y, 10240=N7Z, 10245=N7A, 10250=N7B, 10255=N7C, 10260=N7D, 10265=N7E, 10270=N7F, 10275=N7G, 10280=N7H, 10285=N7I, 10290=N7J, 10295=N7K, 10300=N7L, 10305=N7M, 10310=N7N, 10315=N7O, 10320=N7P, 10325=N7Q, 10330=N7R, 10335=N7S, 10340=N7T, 10345=N7U, 10350=N7V, 10355=N7W, 10360=N7X, 10365=N7Y, 10370=N7Z, 10375=N7A, 10380=N7B, 10385=N7C, 10390=N7D, 10395=N7E, 10400=N7F, 10405=N7G, 10410=N7H, 10415=N7I, 10420=N7J, 10425=N7K, 10430=N7L, 10435=N7M, 10440=N7N, 10445=N7O, 10450=N7P, 10455=N7Q, 10460=N7R, 10465=N7S, 10470=N7T, 10475=N7U, 10480=N7V, 10485=N7W, 10490=N7X, 10495=N7Y, 10500=N7Z, 10505=N7A, 10510=N7B, 10515=N7C, 10520=N7D, 10525=N7E, 10530=N7F, 10535=N7G, 10540=N7H, 10545=N7I, 10550=N7J, 10555=N7K, 10560=N7L, 10565=N7M, 10570=N7N, 10575=N7O, 10580=N7P, 10585=N7Q, 10590=N7R, 1
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1390 IF RS="LIN" THEN L1=0: GOTO 1440
1400 IF VRL(F1$)=1 THEN RS="LOG": GOTO 1440
1410 GOTO 1360
1420 IF L1=1 THEN RS="LOG"
1430 IF L1=0 THEN RS="LIN"
1440 REM * ONWARDS
1450 PRINT RS; " SWEEP"
1460 PRINT "START FREQ="; F1; "HZ "
1470 INPUT "INPUT NEW START FREQ (OR '0' TO SAVE OLD VALUE)": F1$
1480 IF F1$="0" GOTO 1510
1490 F1=VRL(F1$)
1500 IF F1<0 GOTO 1500
1510 REM * END FREQUENCY
1520 PRINT "END FREQ="; F2; "HZ "
1530 INPUT "INPUT NEW END FREQ (OR '0' TO SAVE OLD VALUE)": F2$
1540 IF F2$="0" GOTO 1500
1550 F2=VRL(F2$)
1560 IF F2<F1 GOTO 1530
1570 REM * INTERVALS
1580 PRINT "INTERVALS="; I2;
1590 INPUT "INPUT NEW INTERVALS (OR '0' TO SAVE OLD VALUE)": I2$
1600 IF I2$="0" GOTO 1580
1610 I2=VRL(I2$)
1620 IF I2<1 GOTO 1570
1630 I3=L1*EXP(LOG(F2/F1)/I2)
1640 IF L1<0 THEN I3=-I3
1650 IF L1=0 THEN I3=1
1660 T3=1.0417*I2 F3=2*PI/I2
1670 REM CLERR THE SCREEN HERE (RHDIO SHICK = CLSD)
1680 REM (CRS-232C TERM = CHR$(274) OR CHR$(27))
1690 PRINT CHR$(274); CHR$(280); CHR$(280);
1700 FOR WR=1 TO 10: NEXT WR: GOTO 1710: (THIS IS A SHIFT LOOP IF NECESSARY)
1710 PRINT "PLOT IN X vs Y (X=1 TO 4, Y=1 TO 4) OR PLOT IN X vs Z (X=1 TO 4, Z=1 TO 4)"?
1720 PRINT TAB(56); "TIME(MICROSEC'S)"
1730 REM START PLOT
1740 PRINT "CALCULATING"
1750 O3=2*PI*F1
1760 REM CLEAR MATRIX
1770 FOR X=1TON4
1780 FOR B=1TON4
1790 Y(X,B)=0
1800 Z(X,B)=0

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```

1810 NEXT B
1820 NEXT X
1830 X=0
1840 IF N<1><1 GOTO 1990
1850 FOR B=1 TO N<1>
1860 N<9>=1/C(2*B-1)
1870 GOSUB 1960
1880 NEXT B
1890 GOTO 2010
1900 REM ** CALCULATE MATRIX
1910 Z=C(2*B)
1920 C=INT(Z)
1930 REM THE .00001 FACTOR CORRECTS ROUNDING ERROR
1940 REM IN MICROSOFT AND ALL 9 DIGIT BINARY BASICS
1950 REM THIS STEP IS MANDATORY, BUT MAY BE OMITTED WITH A VARIABLE.
1960 Z=INT(1E9*(Z-C), .00001)
1970 IF X<0 GOTO 2040
1980 Y<C, C>=Y<C, C>+N<9>
1990 GOTO 2010
2000 Z<C, C>=Z<C, C>+N<9>
2010 IF Z<C, C>=0 GOTO 2040
2020 IF X<0 GOTO 2040
2030 Y<C, Z>=Y<C, Z>-N<9>
2040 Y<Z, C>=Y<Z, C>-N<9>
2050 Y<Z, Z>=Y<Z, Z>+N<9>
2060 RETURN
2070 Z<C, Z>=Z<C, Z>-N<9>
2080 Z<Z, C>=Z<Z, C>-N<9>
2090 Z<Z, Z>=Z<Z, Z>+N<9>
2100 RETURN
2110 X=1
2120 IF N<5>+1>N<2>+N<1> GOTO 2170
2130 FOR B=N<2>+N<1>+1 TO N<5>-N<4>
2140 N<9>=03*C(2*B-1)
2150 GOSUB 1900
2160 NEXT B
2170 IF N<5>-N<4><N<2>+N<1>+1 GOTO 2240
2180 FOR B=N<5>-N<4>+1 TO N<5>-N<4>
2190 N<9>=-1/C(2*B-1)*03
2200 GOSUB 1900
2210 NEXT B
2220 REM
2230 IF N<5><N<5>-N<4>+1 GOTO 2460
2240 FOR B=N<5>-N<4>+1 TO N<5>
2250 Z=C(2*B)
2260 X=INT(Z)
2270 Z=2-X+.00001
2280 N<6>=INT(X/100)
2290 N<8>=INT(X-N<6>)*100
2300 N<9>=INT(Z*1000)
2310 N<7>=INT(Z*10000-N<9>*1000)
2320 C=-3
2330 X=-3
2340 C=C+2
2350 IF C>1 GOTO 2440
2360 X=X+2
2370 IF X>1 GOTO 2330
2380 Y=N<C>(C+13)/20
2390 Z=Y*X GOTO 2360
2400 Z=N<C>(X+17)/20

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2410 IF Z=0 GOTO 2360
2420 Y<Z, Y=Y*(2, Y+0.2*B-1)*D*W
2430 GOTO 2360
2440 NEXT I
2450
2460 REM PRINT X,Y,Z
2470 REM PRINT C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z
2480 REM PRINT A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z
2490 REM PRINT A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z
2500 D=N(8)*N(8)+N(9)*N(9)
2510 C=0
2520 IF B<>2 GOTO 2570
2530 F3=1
2540 X=1
2550 C=2
2560 REM PRINT X,Y,Z
2570 REM PRINT C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z
2580 REM PRINT A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z
2590 IF C<>B GOTO 2620
2600 REM PRINT X,Y,Z
2610 GOTO 2460
2620
2630 IF C<>B THEN 2640
2640 N(6)=Z(C,B)
2650 N(7)=Z(B,X)
2660 Y=(1-2*F3)*Y(C,B)*Y(B,X)-N(6)*N(7)
2670 Z=(1-2*F3)*Y(C,B)*N(7)+N(6)*Y(B,X)
2680 IF D=0 THEN D=1E-37 :REM UNDERFLOW
2690 IF F3=1 THEN 2740
2700 Y(C,X)=Y(C,X)-(Y+N(8)+Z*N(9))/D
2710 Z(C,X)=Z(C,X)-(Z*N(8)-Y*N(9))/D
2720 GOTO 2620
2730 Y=Y/D
2740 Z=Z/D
2750 X=SQR(Y*Y+Z*Z)
2760 IF X<>0 GOTO 2800
2770 REM NO CONTINUITY FLAG
2780 PRINT "NO CONTINUITY FOR F=",03/(2*PI), "HZ"
2790 GOTO 2930
2800 IF Z>0 THEN Z4=1
2810 IF Z<0 THEN Z4=0
2820 C=(2*Z4-1)*PI/2
2830 IF Y=0 GOTO 2890
2840 C=ATN(Z/Y)
2850 IF Y<0 GOTO 2890
2860 C=C+PI
2870 IF Z<=0 GOTO 2890
2880 C=C-2*PI
2890 REM OUT DATA
2900 DB=<INT<2E3*LOG(X)/LN+.5>>/100
2910 REM ADJUST TABS TO SUIT VIDEO DISPLAY
2920 PRINT 03/(2*PI), TAB(19), DB, TAB(39), 180*C/PI, TAB(56), 1E6*C/03
2930 REM INCREMENT OMEGA
2940 IF 03>=2*PI*(PI-.001) GOTO 3030
2950 IF L1<>0 THEN L5=0
2960 IF L1=0 THEN L5=1
2970 03=L1*03+I3+L5*(03+I3)
2980 IF 03>2*PI+F2 GOTO 3000
2990 GOTO 1760
3000 REM * LAST POINT

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3010 $03=2*\pi*f2$
3020 GOTO 1760
3030 INPUT "ENTER <3> FOR NEW SWEEP"; P\$
3040 IF P\$="" THEN GOTO 1760