```
>> % JEPH MARI M. DALIGDIG BS-ECE III
% Problem 4: DTFT of x1(n) = 0.6 ^ |n|*(u(n+10)-u(n-11))
>> [x11,n11] = stepseq(-10,-11,11)

x11 =

  1×23 logical array

   0   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
1


n11 =

   -11   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2
3     4     5     6     7     8     9    10    11

>>  [x12,n12] = stepseq(11,-11,11)

x12 =

  1×23 logical array

   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
1


n12 =

   -11   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2
3     4     5     6     7     8     9    10    11

>> [x13,n13] = sigadd(x11,n11,-x12,n12)

x13 =

     0     1     1     1     1     1     1     1     1     1     1     1     1     1
1     1     1     1     1     1     1     1     0


n13 =

   -11   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2
3     4     5     6     7     8     9    10    11

>> n1 = n13

n1 =

   -11   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2
3     4     5     6     7     8     9    10    11
```

```
>> x1 = (0.6 .^ abs(n1)).*x13

x1 =

  Columns 1 through 14

         0    0.0060    0.0101    0.0168    0.0280    0.0467    0.0778    0.1296↙
0.2160    0.3600    0.6000    1.0000    0.6000    0.3600

  Columns 15 through 23

    0.2160    0.1296    0.0778    0.0467    0.0280    0.0168    0.0101    0.0060↙
0

>> w1 = linspace(-pi,pi,201)

w1 =

  Columns 1 through 14

   -3.1416   -3.1102   -3.0788   -3.0473   -3.0159   -2.9845   -2.9531   -2.9217↙
-2.8903   -2.8588   -2.8274   -2.7960   -2.7646   -2.7332

  Columns 15 through 28

   -2.7018   -2.6704   -2.6389   -2.6075   -2.5761   -2.5447   -2.5133   -2.4819↙
-2.4504   -2.4190   -2.3876   -2.3562   -2.3248   -2.2934

  Columns 29 through 42

   -2.2619   -2.2305   -2.1991   -2.1677   -2.1363   -2.1049   -2.0735   -2.0420↙
-2.0106   -1.9792   -1.9478   -1.9164   -1.8850   -1.8535

  Columns 43 through 56

   -1.8221   -1.7907   -1.7593   -1.7279   -1.6965   -1.6650   -1.6336   -1.6022↙
-1.5708   -1.5394   -1.5080   -1.4765   -1.4451   -1.4137

  Columns 57 through 70

   -1.3823   -1.3509   -1.3195   -1.2881   -1.2566   -1.2252   -1.1938   -1.1624↙
-1.1310   -1.0996   -1.0681   -1.0367   -1.0053   -0.9739

  Columns 71 through 84

   -0.9425   -0.9111   -0.8796   -0.8482   -0.8168   -0.7854   -0.7540   -0.7226↙
-0.6912   -0.6597   -0.6283   -0.5969   -0.5655   -0.5341

  Columns 85 through 98
```

```
   -0.5027   -0.4712   -0.4398   -0.4084   -0.3770   -0.3456   -0.3142   -0.2827↙
-0.2513   -0.2199   -0.1885   -0.1571   -0.1257   -0.0942

  Columns 99 through 112

   -0.0628   -0.0314         0    0.0314    0.0628    0.0942    0.1257    0.1571↙
0.1885    0.2199    0.2513    0.2827    0.3142    0.3456

  Columns 113 through 126

    0.3770    0.4084    0.4398    0.4712    0.5027    0.5341    0.5655    0.5969↙
0.6283    0.6597    0.6912    0.7226    0.7540    0.7854

  Columns 127 through 140

    0.8168    0.8482    0.8796    0.9111    0.9425    0.9739    1.0053    1.0367↙
1.0681    1.0996    1.1310    1.1624    1.1938    1.2252

  Columns 141 through 154

    1.2566    1.2881    1.3195    1.3509    1.3823    1.4137    1.4451    1.4765↙
1.5080    1.5394    1.5708    1.6022    1.6336    1.6650

  Columns 155 through 168

    1.6965    1.7279    1.7593    1.7907    1.8221    1.8535    1.8850    1.9164↙
1.9478    1.9792    2.0106    2.0420    2.0735    2.1049

  Columns 169 through 182

    2.1363    2.1677    2.1991    2.2305    2.2619    2.2934    2.3248    2.3562↙
2.3876    2.4190    2.4504    2.4819    2.5133    2.5447

  Columns 183 through 196

    2.5761    2.6075    2.6389    2.6704    2.7018    2.7332    2.7646    2.7960↙
2.8274    2.8588    2.8903    2.9217    2.9531    2.9845

  Columns 197 through 201

    3.0159    3.0473    3.0788    3.1102    3.1416

>>  X1 = DTFT(x1,n1,w1)

X1 =

  Columns 1 through 7

  -0.2545 + 0.0000i  -0.2393 + 0.0862i  -0.1956 + 0.1618i  -0.1288 + 0.2177i  -0.0472 +↙
0.2475i   0.0393 + 0.2479i   0.1205 + 0.2192i
```

```
  Columns 8 through 14

   0.1873 + 0.1651i   0.2321 + 0.0919i   0.2501 + 0.0079i   0.2391 - 0.0777i   0.2000 -↙
0.1552i   0.1369 - 0.2157i   0.0564 - 0.2521i

  Columns 15 through 21

  -0.0328 - 0.2594i  -0.1202 - 0.2360i  -0.1955 - 0.1836i  -0.2490 - 0.1078i  -0.2737 -↙
0.0172i  -0.2658 + 0.0772i  -0.2257 + 0.1640i

  Columns 22 through 28

  -0.1579 + 0.2323i  -0.0702 + 0.2736i   0.0267 + 0.2827i   0.1216 + 0.2584i   0.2033 +↙
0.2033i   0.2622 + 0.1234i   0.2913 + 0.0275i

  Columns 29 through 35

   0.2869 - 0.0737i   0.2486 - 0.1690i   0.1797 - 0.2473i   0.0869 - 0.2992i  -0.0200 -↙
0.3174i  -0.1290 - 0.2982i  -0.2273 - 0.2421i

  Columns 36 through 42

  -0.3024 - 0.1541i  -0.3439 - 0.0434i  -0.3452 + 0.0772i  -0.3044 + 0.1932i  -0.2250 +↙
0.2901i  -0.1154 + 0.3553i   0.0119 + 0.3797i

  Columns 43 through 49

   0.1423 + 0.3593i   0.2601 + 0.2950i   0.3511 + 0.1930i   0.4038 + 0.0640i   0.4107 -↙
0.0783i   0.3689 - 0.2181i   0.2806 - 0.3392i

  Columns 50 through 56

   0.1535 - 0.4264i  -0.0000 - 0.4674i  -0.1635 - 0.4542i  -0.3181 - 0.3845i  -0.4443 -↙
0.2627i  -0.5244 - 0.1000i  -0.5453 + 0.0864i

  Columns 57 through 63

  -0.5000 + 0.2749i  -0.3898 + 0.4422i  -0.2241 + 0.5660i  -0.0197 + 0.6282i   0.2006 +↙
0.6174i   0.4112 + 0.5301i   0.5861 + 0.3719i

  Columns 64 through 70

   0.7020 + 0.1569i   0.7410 - 0.0936i   0.6924 - 0.3528i   0.5548 - 0.5908i   0.3364 -↙
0.7774i   0.0557 - 0.8853i  -0.2596 - 0.8936i

  Columns 71 through 77

  -0.5745 - 0.7908i  -0.8501 - 0.5777i  -1.0474 - 0.2689i  -1.1331 + 0.1071i  -1.0841 +↙
0.5101i  -0.8919 + 0.8919i  -0.5655 + 1.2017i

  Columns 78 through 84
```

```
  -0.1316 + 1.3925i   0.3665 + 1.4276i   0.8736 + 1.2855i   1.3273 + 0.9643i   1.6649 +↙
0.4837i   1.8311 - 0.1152i   1.7841 - 0.7721i

  Columns 85 through 91

   1.5033 - 1.4117i   0.9940 - 1.9509i   0.2915 - 2.3074i  -0.5389 - 2.4107i  -1.4047 -↙
2.2135i  -2.1952 - 1.7027i  -2.7938 - 0.9078i

  Columns 92 through 98

  -3.0956 + 0.0973i  -3.0251 + 1.1977i  -2.5529 + 2.2506i  -1.7068 + 3.1046i  -0.5739 +↙
3.6232i   0.7077 + 3.7097i   1.9671 + 3.3262i

  Columns 99 through 105

   3.0273 + 2.5044i   3.7339 + 1.3443i   3.9819 + 0.0000i   3.7339 - 1.3443i   3.0273 -↙
2.5044i   1.9671 - 3.3262i   0.7077 - 3.7097i

  Columns 106 through 112

  -0.5739 - 3.6232i  -1.7068 - 3.1046i  -2.5529 - 2.2506i  -3.0251 - 1.1977i  -3.0956 -↙
0.0973i  -2.7938 + 0.9078i  -2.1952 + 1.7027i

  Columns 113 through 119

  -1.4047 + 2.2135i  -0.5389 + 2.4107i   0.2915 + 2.3074i   0.9940 + 1.9509i   1.5033 +↙
1.4117i   1.7841 + 0.7721i   1.8311 + 0.1152i

  Columns 120 through 126

   1.6649 - 0.4837i   1.3273 - 0.9643i   0.8736 - 1.2855i   0.3665 - 1.4276i  -0.1316 -↙
1.3925i  -0.5655 - 1.2017i  -0.8919 - 0.8919i

  Columns 127 through 133

  -1.0841 - 0.5101i  -1.1331 - 0.1071i  -1.0474 + 0.2689i  -0.8501 + 0.5777i  -0.5745 +↙
0.7908i  -0.2596 + 0.8936i   0.0557 + 0.8853i

  Columns 134 through 140

   0.3364 + 0.7774i   0.5548 + 0.5908i   0.6924 + 0.3528i   0.7410 + 0.0936i   0.7020 -↙
0.1569i   0.5861 - 0.3719i   0.4112 - 0.5301i

  Columns 141 through 147

   0.2006 - 0.6174i  -0.0197 - 0.6282i  -0.2241 - 0.5660i  -0.3898 - 0.4422i  -0.5000 -↙
0.2749i  -0.5453 - 0.0864i  -0.5244 + 0.1000i

  Columns 148 through 154
```

```
  -0.4443 + 0.2627i  -0.3181 + 0.3845i  -0.1635 + 0.4542i  -0.0000 + 0.4674i   0.1535 +↙
0.4264i   0.2806 + 0.3392i   0.3689 + 0.2181i

  Columns 155 through 161

   0.4107 + 0.0783i   0.4038 - 0.0640i   0.3511 - 0.1930i   0.2601 - 0.2950i   0.1423 -↙
0.3593i   0.0119 - 0.3797i  -0.1154 - 0.3553i

  Columns 162 through 168

  -0.2250 - 0.2901i  -0.3044 - 0.1932i  -0.3452 - 0.0772i  -0.3439 + 0.0434i  -0.3024 +↙
0.1541i  -0.2273 + 0.2421i  -0.1290 + 0.2982i

  Columns 169 through 175

  -0.0200 + 0.3174i   0.0869 + 0.2992i   0.1797 + 0.2473i   0.2486 + 0.1690i   0.2869 +↙
0.0737i   0.2913 - 0.0275i   0.2622 - 0.1234i

  Columns 176 through 182

   0.2033 - 0.2033i   0.1216 - 0.2584i   0.0267 - 0.2827i  -0.0702 - 0.2736i  -0.1579 -↙
0.2323i  -0.2257 - 0.1640i  -0.2658 - 0.0772i

  Columns 183 through 189

  -0.2737 + 0.0172i  -0.2490 + 0.1078i  -0.1955 + 0.1836i  -0.1202 + 0.2360i  -0.0328 +↙
0.2594i   0.0564 + 0.2521i   0.1369 + 0.2157i

  Columns 190 through 196

   0.2000 + 0.1552i   0.2391 + 0.0777i   0.2501 - 0.0079i   0.2321 - 0.0919i   0.1873 -↙
0.1651i   0.1205 - 0.2192i   0.0393 - 0.2479i

  Columns 197 through 201

  -0.0472 - 0.2475i  -0.1288 - 0.2177i  -0.1956 - 0.1618i  -0.2393 - 0.0862i  -0.2545 -↙
0.0000i

>> magX1 = abs(X1)

magX1 =

  Columns 1 through 14

    0.2545    0.2543    0.2538    0.2530    0.2520    0.2510    0.2502    0.2497↙
0.2497    0.2502    0.2514    0.2532    0.2555    0.2583

  Columns 15 through 28

    0.2615    0.2648    0.2681    0.2713    0.2742    0.2768    0.2790    0.2808↙
0.2825    0.2840    0.2856    0.2875    0.2898    0.2926
```

```
  Columns 29 through 42

    0.2962    0.3006    0.3057    0.3115    0.3180    0.3249    0.3321    0.3394↙
0.3466    0.3537    0.3606    0.3672    0.3736    0.3799

  Columns 43 through 56

    0.3864    0.3932    0.4007    0.4089    0.4181    0.4285    0.4402    0.4532↙
0.4674    0.4827    0.4990    0.5162    0.5339    0.5521

  Columns 57 through 70

    0.5706    0.5895    0.6087    0.6285    0.6491    0.6709    0.6941    0.7193↙
0.7469    0.7771    0.8105    0.8470    0.8871    0.9305

  Columns 71 through 84

    0.9775    1.0278    1.0814    1.1381    1.1981    1.2613    1.3281    1.3988↙
1.4739    1.5543    1.6406    1.7338    1.8347    1.9440

  Columns 85 through 98

    2.0622    2.1896    2.3258    2.4702    2.6216    2.7781    2.9376    3.0971↙
3.2535    3.4033    3.5428    3.6684    3.7766    3.8643

  Columns 99 through 112

    3.9289    3.9685    3.9819    3.9685    3.9289    3.8643    3.7766    3.6684↙
3.5428    3.4033    3.2535    3.0971    2.9376    2.7781

  Columns 113 through 126

    2.6216    2.4702    2.3258    2.1896    2.0622    1.9440    1.8347    1.7338↙
1.6406    1.5543    1.4739    1.3988    1.3281    1.2613

  Columns 127 through 140

    1.1981    1.1381    1.0814    1.0278    0.9775    0.9305    0.8871    0.8470↙
0.8105    0.7771    0.7469    0.7193    0.6941    0.6709

  Columns 141 through 154

    0.6491    0.6285    0.6087    0.5895    0.5706    0.5521    0.5339    0.5162↙
0.4990    0.4827    0.4674    0.4532    0.4402    0.4285

  Columns 155 through 168

    0.4181    0.4089    0.4007    0.3932    0.3864    0.3799    0.3736    0.3672↙
0.3606    0.3537    0.3466    0.3394    0.3321    0.3249
```

```
  Columns 169 through 182

    0.3180    0.3115    0.3057    0.3006    0.2962    0.2926    0.2898    0.2875↙
0.2856    0.2840    0.2825    0.2808    0.2790    0.2768

  Columns 183 through 196

    0.2742    0.2713    0.2681    0.2648    0.2615    0.2583    0.2555    0.2532↙
0.2514    0.2502    0.2497    0.2497    0.2502    0.2510

  Columns 197 through 201

    0.2520    0.2530    0.2538    0.2543    0.2545

>> phaX1 = angle(X1)

phaX1 =

  Columns 1 through 14

    3.1416    2.7960    2.4504    2.1049    1.7593    1.4137    1.0681    0.7226↙
0.3770    0.0314   -0.3142   -0.6597   -1.0053   -1.3509

  Columns 15 through 28

   -1.6965   -2.0420   -2.3876   -2.7332   -3.0788    2.8588    2.5133    2.1677↙
1.8221    1.4765    1.1310    0.7854    0.4398    0.0942

  Columns 29 through 42

   -0.2513   -0.5969   -0.9425   -1.2881   -1.6336   -1.9792   -2.3248   -2.6704↙
-3.0159    2.9217    2.5761    2.2305    1.8850    1.5394

  Columns 43 through 56

    1.1938    0.8482    0.5027    0.1571   -0.1885   -0.5341   -0.8796   -1.2252↙
-1.5708   -1.9164   -2.2619   -2.6075   -2.9531    2.9845

  Columns 57 through 70

    2.6389    2.2934    1.9478    1.6022    1.2566    0.9111    0.5655    0.2199↙
-0.1257   -0.4712   -0.8168   -1.1624   -1.5080   -1.8535

  Columns 71 through 84

   -2.1991   -2.5447   -2.8903    3.0473    2.7018    2.3562    2.0106    1.6650↙
1.3195    0.9739    0.6283    0.2827   -0.0628   -0.4084

  Columns 85 through 98

   -0.7540   -1.0996   -1.4451   -1.7907   -2.1363   -2.4819   -2.8274    3.1102↙
```

```
2.7646    2.4190    2.0735    1.7279    1.3823    1.0367

  Columns 99 through 112

    0.6912    0.3456         0   -0.3456   -0.6912   -1.0367   -1.3823   -1.7279↙
-2.0735   -2.4190   -2.7646   -3.1102    2.8274    2.4819

  Columns 113 through 126

    2.1363    1.7907    1.4451    1.0996    0.7540    0.4084    0.0628   -0.2827↙
-0.6283   -0.9739   -1.3195   -1.6650   -2.0106   -2.3562

  Columns 127 through 140

   -2.7018   -3.0473    2.8903    2.5447    2.1991    1.8535    1.5080    1.1624↙
0.8168    0.4712    0.1257   -0.2199   -0.5655   -0.9111

  Columns 141 through 154

   -1.2566   -1.6022   -1.9478   -2.2934   -2.6389   -2.9845    2.9531    2.6075↙
2.2619    1.9164    1.5708    1.2252    0.8796    0.5341

  Columns 155 through 168

    0.1885   -0.1571   -0.5027   -0.8482   -1.1938   -1.5394   -1.8850   -2.2305↙
-2.5761   -2.9217    3.0159    2.6704    2.3248    1.9792

  Columns 169 through 182

    1.6336    1.2881    0.9425    0.5969    0.2513   -0.0942   -0.4398   -0.7854↙
-1.1310   -1.4765   -1.8221   -2.1677   -2.5133   -2.8588

  Columns 183 through 196

    3.0788    2.7332    2.3876    2.0420    1.6965    1.3509    1.0053    0.6597↙
0.3142   -0.0314   -0.3770   -0.7226   -1.0681   -1.4137

  Columns 197 through 201

   -1.7593   -2.1049   -2.4504   -2.7960   -3.1416

>> Hf_1 = figure

Hf_1 =

  Figure (1) with properties:

      Number: 1
        Name: ''
       Color: [0.9400 0.9400 0.9400]
    Position: [520 378 560 420]
```

```
       Units: 'pixels'

  Show all properties

>> set(Hf_1,'NumberTitle','off','Name','Problem 4')
>> subplot(2,1,1)
>> plot(w1/pi,magX1,'LineWidth',1.5)
>> axis([-1 1 0 4.5])
>>  wtick = [-1:0.2:1]

wtick =

   -1.0000   -0.8000   -0.6000   -0.4000   -0.2000         0    0.2000    0.4000↙
0.6000    0.8000    1.0000

>> magtick = [0:0.5:4.5]

magtick =

         0    0.5000    1.0000    1.5000    2.0000    2.5000    3.0000    3.5000↙
4.0000    4.5000

>> xlabel('\omega/\pi','Fontsize',15)
>> ylabel('|X|','Fontsize',15)
>> title('Magnitude response','Fontsize',15)
>> set(gca,'XTick',wtick)
>> set(gca,'YTick',magtick)
>> subplot(2,1,2)
>> plot(w1/pi,phaX1*180/pi,'LineWidth',1.5)
>> axis([-1,1,-180,180])
>> phatick = [-180 0 180]

phatick =

  -180     0   180

>> xlabel('\omega/\pi','Fontsize',15)
>> ylabel('\Degrees','Fontsize',15)
Warning: Error updating Text.

 String scalar or character vector must have valid interpreter syntax:
\Degrees

>> title('Phase Response','Fontsize',15)
>> set(gca,'XTick',wtick)
>> set(gca,'YTick',phatick)
>>
```