

```

1  t=[0:2*pi/40:2*pi]; # N=41 (Remember to add 1, if step size is changed)
2
3
4  % Generate the required wave data
5
6  %x = [1,1,1,1]; # Change N=4
7  %x = [1,1,1,1,1,1,0,0,0,0,0,0]; # Change N=12
8
9  %x = sin(t);
10 %x = sin(t) + 1;
11 x = sin(t) + 0.5*cos(3*t+pi/2);
12 %x = t / (2*pi);
13
14 N = 41;
15
16 % Calculate DFT
17 for k = 0:(N-1)
18     F(k+1) = 0; # Add 1, since Octave does not allow subscript 0
19     for n = 0:(N-1)
20         F(k+1) = F(k+1) + x(n+1)*exp(-i*2*pi*k*n/N);
21     endfor
22 endfor
23
24 printf(" \n DFT Values \n");
25 for k = 0:(N-1)
26     printf("(%7.3f , %7.3fi ) \n" , real(F(k+1)), imag(F(k+1)));
27 endfor
28
29
30 % Plot the original data and DFT spectrum (Figure(1))
31 a = [0:(N-1)];
32 figure(1);
33
34 subplot(2,1,1);
35 plot(a,x);
36 axis([0,(N-1),-2,2]);
37 title("Original Function");
38
39 subplot(2,1,2);
40 bar(a,abs(F));
41 title("DFT - Frequecy Spectrum");
42
43 %Caluclate & plot Inverse DFT to get original (Figure(2))
44 for n = 0:(N-1)
45     FI(n+1) = 0;
46     for k = 0:(N-1)
47         FI(n+1) = FI(n+1) + F(k+1)*exp(i*2*pi*k*n/N);
48     endfor
49     FI(n+1) = FI(n+1)/N;
50 endfor
51
52 figure(2);
53 subplot(2,1,1);
54 plot(a,FI);
55 axis([0,(N-1),-2,2]);
56 title("Inverse DFT - All Frequecies");
57

```

D.F.T.

ApplicationExample

```

58 %Compressed DFT data (10% of fundamental threshold )
59 % F(2) - Fundamental freq value is assumed to be the largest
60 % Note: Normally F(1) is the fundamental when values are 0 to (N-1) !!
61 for k = 0:(N-1)
62     FC(k+1) = 0;
63     if ( abs(F(k+1)) >= 0.1*abs(F(2)) ) FC(k+1) = F(k+1); endif
64 endfor
65
66 printf(" \n Compressed DFT Values \n");
67 for k = 0:(N-1)
68     printf("(%7.3f , %7.3fi ) \n" , real(FC(k+1)), imag(FC(k+1)));
69 endfor
70
71
72 % Calculate and plot the original signal from COMPRESSED DFT values
73 for n = 0:(N-1)
74     FCI(n+1) = 0;
75     for k = 0:(N-1)
76         FCI(n+1) = FCI(n+1) + FC(k+1)*exp(i*2*pi*k*n/N);
77     endfor
78     FCI(n+1) = FCI(n+1)/N;
79 endfor
80
81 subplot(2,1,2);
82 plot(a,FCI);
83 axis([0,(N-1),-2,2]);
84 title("Inverse DFT - Compressed Frequency Data");
85
86

```

