**Q1a**

Fs = 12000;

t = 0:1/Fs:0.01;

x1 = 3 \* cos(2000 \* pi \* t);

x2 = 5 \* sin(6000 \* pi \* t);

x3 = 10 \* cos(12000 \* pi \* t);

x = x1 + x2 + x3;

subplot(4,2,1);

plot(t, x1)

title('x1(t) = 3cos(2000?t)');

subplot(4,2,2);

plot(t, x2);

title('x2(t) = 5sin(6000?t)');

subplot(4,2,3);

plot(t, x3);

title('x3(t) = 10cos(12000?t)');

subplot(4,2,4);

plot(t, x);

title('x(t) = x1(t) + x2(t) + x3(t)');

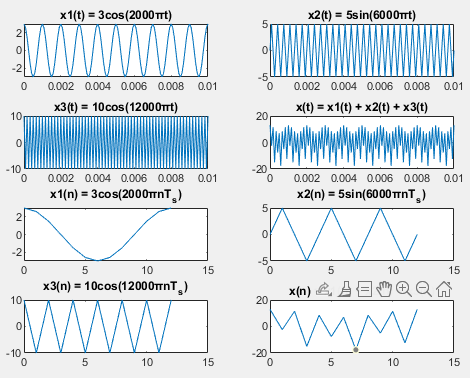
**Q1b**

Ts = 1/Fs;

n = 0:1:12;

t\_n = n \* Ts;

x1\_n = 3 \* cos(2000 \* pi \* t\_n);

x2\_n = 5 \* sin(6000 \* pi \* t\_n);

x3\_n = 10 \* cos(12000 \* pi \* t\_n);

x\_n = x1\_n + x2\_n + x3\_n;

subplot(4,2,5);

plot(n, x1\_n);

title('x1(n) = 3cos(2000?nT\_s)');

subplot(4,2,6);

plot(n, x2\_n)

title('x2(n) = 5sin(6000?nT\_s)');

subplot(4,2,7);

plot(n, x3\_n)

title('x3(n) = 10cos(12000?nT\_s)');

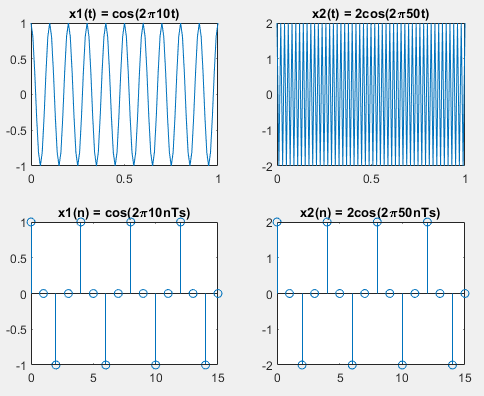
subplot(4,2,8);

plot(n, x\_n)

title('x(n) = x1(n) + x2(n) + x3(n)');

**Q2a**

Dt = 0.01;

****t = 0:Dt:1;

x1t = cos(2\*pi\*10\*t);

x2t = 2\*cos(2\*pi\*50\*t);

subplot(2,2,1);

plot(t,x1t);

title('x1(t) = cos(2\pi10t)');

subplot(2,2,2);

plot(t,x2t);

title('x2(t) = 2cos(2\pi50t)');

**b)**

Fs = 40;

n = 0:15;

Ts = 1/Fs;

x1n = cos(2\*pi\*10\*n\*Ts);

x2n = 2\*cos(2\*pi\*50\*n\*Ts);

subplot(2,2,3);

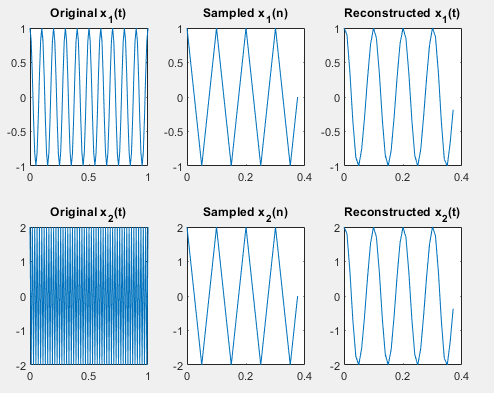
stem(n,x1n);

title('x1(n) = cos(2\pi10nTs)');

subplot(2,2,4);

stem(n,x2n);

title('x2(n) = 2cos(2\pi50nTs)');

**c)**

Dt = 0.01;

t = 0:Dt:1;

Fs = 40;

Ts = 1/Fs;

n = 0:15;

x1\_t = cos(2\*pi\*10\*t);

x2\_t = 2\*cos(2\*pi\*50\*t);

x1\_n = cos(2\*pi\*10\*n\*Ts);

x2\_n = 2\*cos(2\*pi\*50\*n\*Ts);

[t\_recon, x1\_recon] = reconst(x1\_n, n, Fs, Dt);

[t\_recon, x2\_recon] = reconst(x2\_n, n, Fs, Dt);

subplot(2,3,1);

plot(t, x1\_t);

title('Original x\_1(t)');

subplot(2,3,2);

plot (n\*Ts, x1\_n);

title('Sampled x\_1(n)');

subplot(2,3,3);

plot(t\_recon, x1\_recon);

title('Reconstructed x\_1(t)');

subplot(2,3,4);

plot(t, x2\_t);

title('Original x\_2(t)');

subplot(2,3,5);

plot (n\*Ts, x2\_n);

title('Sampled x\_2(n)');

subplot(2,3,6);

plot(t\_recon, x2\_recon);

title('Reconstructed x\_2(t)');

function [t, x] = reconst(xn, n, Fs, Dt)

Ts = 1 / Fs;

t = min(n) \* Ts : Dt : max(n) \* Ts;

nTs = n \* Ts;

x = xn \* sinc(Fs \* (ones(length(n), 1) \* t - nTs' \* ones(1, length(t))));

end