2.22

A downsampler system is defined in (2.24). Consider the sequence x[n] = cos(0.1πn)

for −30 ≤ n ≤ 30. Using the stem function plot

(a) x[n] versus n.

(b) A down sampled signal y[n] for M = 5.

(c) A down sampled signal y[n] for M = 20.

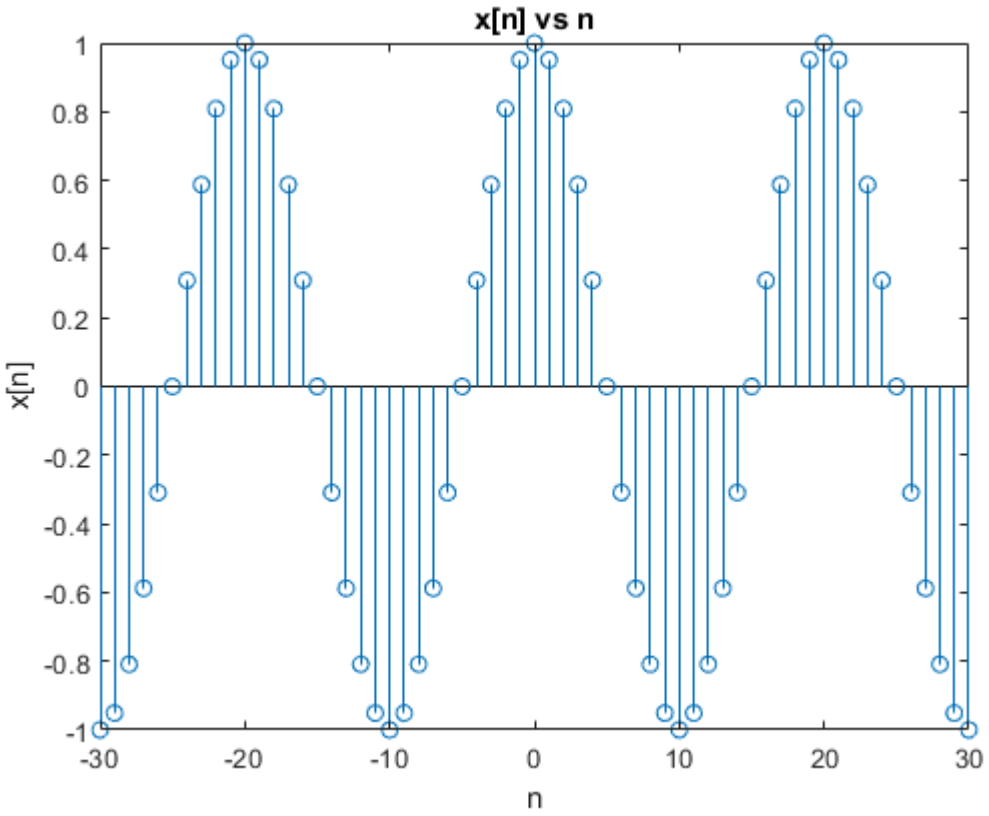
(d) How does the downsampled signal appear? Compressed or expanded.

y[n] = H{x[n]} = x[nM] (2.24)

a)

```
n = [-30:30];
xn = cos(0.1*pi*n);

stem(n,xn)
title('x[n] vs n'); xlabel('n') ; ylabel('x[n]');
```

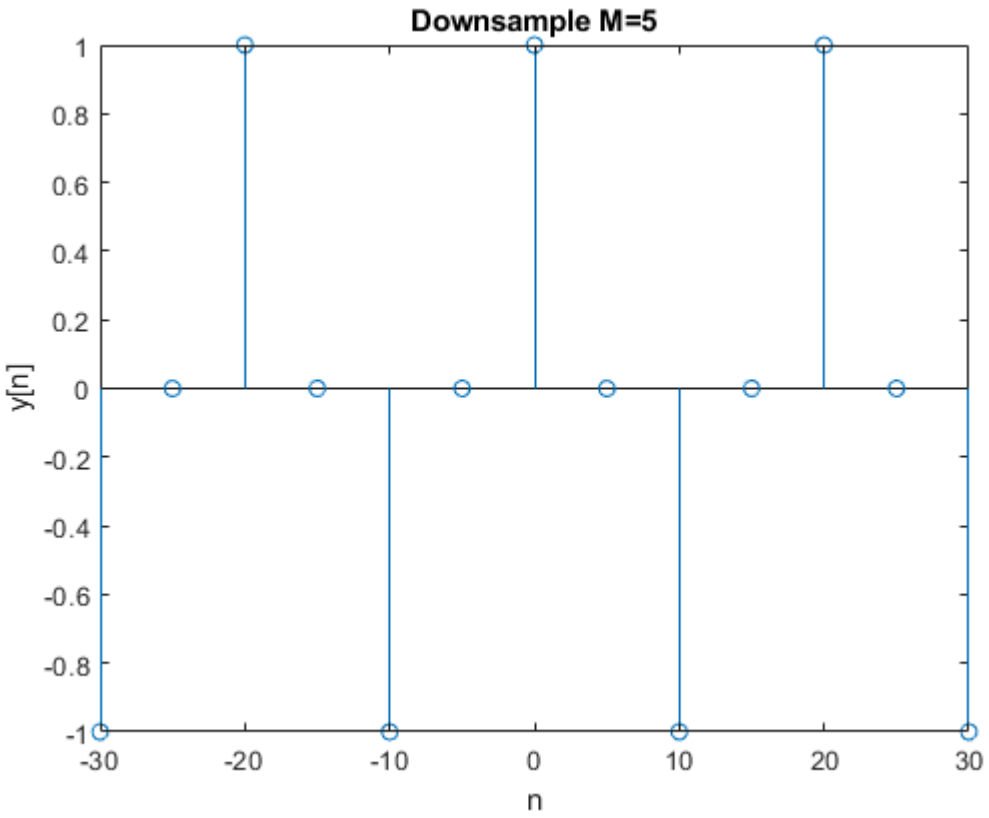


b)

```
n5d = downsample(n,5);
xn5d = downsample(xn,5);

stem(n5d,xn5d)
```

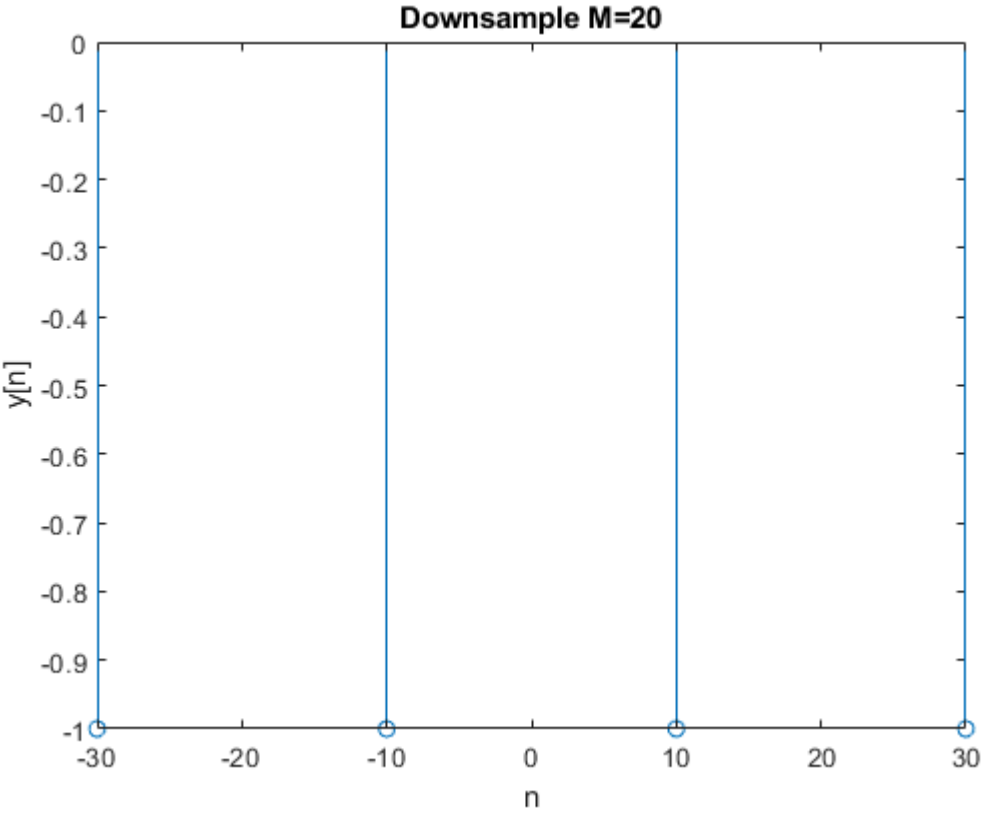
```
title('Downsample M=5'); xlabel('n') ; ylabel('y[n]');
```



c)

```
n20d = downsample(n,20);
xn20d = downsample(xn,20);

stem(n20d,xn20d)
title('Downsample M=20'); xlabel('n') ; ylabel('y[n]');
```



d) Compressed