```matlab
% Joseph R. Palicke
% Lab 11 Part 1

%encoding

clc;
clear all;
close all;

n = 15;
k = 11;
M = n - k;
P = [1 0 0 1 1];

[H G] = hammgen(M,P);

disp('G equals: ')
int2str(G)
disp('H equals: ')
int2str(H)

%U1, U2, U3

U1 = [1 1 1 1 0 0 0 0 0 1 1];

V1 = encode(U1, n, k, 'hamming', P);

disp('V1 equals')
int2str(V1)

U2 = [0 1 0 0 1 0 1 0 1 0 0];

V2 = encode(U2, n, k, 'hamming', P);

disp('V2 equals')
int2str(V2)

U3 = [1 1 0 1 1 0 0 0 1 1 0];

V3 = encode(U3, n, k, 'hamming', P);

disp('V3 equals')
int2str(V3)

% Generate all valid codewords

Messages = dec2bin(0:2^(k)-1);

Codewords = [];
for i = 1:2^k
    Codewords(i,:) = mod(Messages(i,:)*G,2);
end
```

```
int2str(Codewords(1:2,:))
int2str(Codewords(2^k-1:2^k,:))
```

G equals:

ans =

```
1   0   0   1   1   0   0   0   0   0   0   0   0   0   0
1   1   0   1   0   1   0   0   0   0   0   0   0   0   0
1   1   1   1   0   0   1   0   0   0   0   0   0   0   0
1   1   1   0   0   0   0   1   0   0   0   0   0   0   0
0   1   1   1   0   0   0   0   1   0   0   0   0   0   0
1   0   1   0   0   0   0   0   0   1   0   0   0   0   0
0   1   0   1   0   0   0   0   0   0   1   0   0   0   0
1   0   1   1   0   0   0   0   0   0   0   1   0   0   0
1   1   0   0   0   0   0   0   0   0   0   0   1   0   0
0   1   1   0   0   0   0   0   0   0   0   0   0   1   0
0   0   1   1   0   0   0   0   0   0   0   0   0   0   1
```

H equals:

ans =

```
1   0   0   0   1   1   1   1   0   1   0   1   1   0   0
0   1   0   0   0   1   1   1   1   0   1   0   1   1   0
0   0   1   0   0   0   1   1   1   1   0   1   0   1   1
0   0   0   1   1   1   1   0   1   0   1   1   0   0   1
```

V1 equals

ans =

```
0   0   0   0   1   1   1   1   0   0   0   0   0   1   1
```

V2 equals

ans =

```
0   0   1   1   0   1   0   0   1   0   1   0   1   0   0
```

V3 equals

ans =

```
0   1   1   1   1   1   0   1   1   0   0   0   0   1   1   0
```

ans =

```
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
0   0   1   1   0   0   0   0   0   0   0   0   0   0   1
```

```
ans =

1  1  0  0  1  1  1  1  1  1  1  1  1  1  0
1  1  1  1  1  1  1  1  1  1  1  1  1  1  1
```

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