```matlab
% Assigning the constant ALPHA.

ALPHA = sqrt(2)/2;

% Defining a symmetic 13-by-13 matix with all the zero elements.

A = zeros(13);

% Defining a 13-by-1 column vector with all the zero elements.

b = zeros(13,1);

% Assigining the specified values to position 2, 8, 10 in cloumn
 vector B.

b(2,1) = 10;
b(8,1) = 15;
b(10,1)= 20;

% Assigning the specified values to the elements of A.

A(1,2) = 1;
A(1,6) = -1;
A(2,3) = 1;
A(3,1) = ALPHA;
A(3,4) = -1;
A(3,5) = -ALPHA;
A(4,1) = ALPHA;
A(4,3) = 1;
A(4,5) = ALPHA;
A(5,4) = 1;
A(5,8) = -1;
A(6,7) = 1;
A(7,5) = ALPHA;
A(7,6) = 1;
A(7,9) = -ALPHA;
A(7,10) = -1;
A(8,5) = ALPHA;
A(8,7) = 1;
A(8,9) = ALPHA;
A(9,10) = 1;
A(9,13) = -1;
A(10,11) = 1;
A(11,8) = 1;
A(11,9) = ALPHA;
A(11,12) = -ALPHA;
A(12,9) = ALPHA;
A(12,11) = 1;
A(12,12) = ALPHA;
A(13,12) = ALPHA;
A(13,13) = 1;
```

```
% Finding the solution of the system given by A*f=b

fHat = A\b;

% Condition number of A with 1-norm
conditionA = cond(A,1);

% Residual of the given solution
r = b - A*fHat;

% 1-norm of the residual
normR = norm(r, 1);

% 1-norm of b and A.
normB = norm(b, 1);

%Bounds on the relative error of the solution.
upperBound = (conditionA*normR)/normB;
lowerBound = (normR)/(normB*conditionA);

% Formating the output

fprintf('The upper bound on relative error is %+e. \n', upperBound);
vec = vertcat(1:13, transpose(fHat));
fprintf('The value of f%d = %+e\n', vec);
```

```
The upper bound on relative error is +6.118363e-15.
The value of f1 = -2.828427e+01
The value of f2 = +2.000000e+01
The value of f3 = +1.000000e+01
The value of f4 = -3.000000e+01
The value of f5 = +1.414214e+01
The value of f6 = +2.000000e+01
The value of f7 = +0.000000e+00
The value of f8 = -3.000000e+01
The value of f9 = +7.071068e+00
The value of f10 = +2.500000e+01
The value of f11 = +2.000000e+01
The value of f12 = -3.535534e+01
The value of f13 = +2.500000e+01
```

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