PRACTICAL No. 1

Aim: 2D Linear Convolution, Circular Convolution between two 2D matrices.

2D Linear Convolution

Example 1:

Code:

```
clc;
x=[4,5,6;7,8,9];
h=[1;1;1];
disp(x,"x=");
disp(h,"h=");
y=conv2(x,h);
disp(y, '2D Linear Convolution result: y =' );
```

Output:

```
x=

   4.    5.    6.
   7.    8.    9.

 h=

   1.
   1.
   1.

 2D Linear Convolution result: y =

   4.     5.     6.
   11.    13.    15.
   11.    13.    15.
   7.     8.     9.
```

Example 2:

Code:

```
clc;
x=[1,2,3;4,5,6;7,8,9];
h=[1,1;1,1;1,1];
disp(x,"x=");
disp(h,"h=");
y=conv2(x,h);
disp(y, '2D Linear Convolution result: y =' );
```

Output:

```
x=

   1.    2.    3.
   4.    5.    6.
   7.    8.    9.

 h=

   1.    1.
   1.    1.
   1.    1.

 2D Linear Convolution result: y =

   1.     3.     5.     3.
   5.     12.    16.    9.
   12.    27.    33.    18.
   11.    24.    28.    15.
   7.     15.    17.    9.
```

2D Circular Convolution

Example 1:

Code:

```
clc ;
x=[1,2;3,4];
h=[5,6;7,8];
disp(x,'x=');
disp(h,'h=');
X=fft2(x);
H=fft2(h);
Y=X.*H;
y=ifft(Y);
disp(y, '2D Circular Correlation Result: y =' );
```

Output:

```
x=

   1.    2.
   3.    4.

 h=

   5.    6.
   7.    8.

 2D Circular Correlation Result: y =

   70.    68.
   62.    60.
```

Example 2:

Code:

```
clc ;
x=[1,2,3;4,5,6;7,8,9];
h=[1,1,1;1,1,1;1,1,1];
disp(x,'x=');
disp(h,'h=');
X=fft2(x);
H=fft2(h);
Y=X.*H;
y=ifft(Y);
disp(y, '2D Circular Correlation Result: y =' );
```

Output:

```
x=

    1.    2.    3.
    4.    5.    6.
    7.    8.    9.

 h=

    1.    1.    1.
    1.    1.    1.
    1.    1.    1.

 2D Circular Correlation Result: y =

   45.   45.   45.
   45.   45.   45.
   45.   45.   45.
```