PRACTICAL 1

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

2D Linear Convolution

Example 1:

Code:

```
clc;
pramod37_x = [4,5,6;7,8,9];
pramod37_h = [1;1;1];
disp(pramod37_x,"pramod37_x=")
disp(pramod37_h,"pramod37_h=")
pramod37_y=conv2(pramod37_x,pramod37_h)
disp(pramod37_y,"2D Linear Convolution result: y=")
```

Ouput:

```
pramod37_x=

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

pramod37_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;
pramod37_x = [1,2,3;4,5,6;7,8,9];
pramod37_h = [1,1;1,1;1,1];
disp(pramod37_x,"pramod37_x=")
disp(pramod37_h,"pramod37_h=")
pramod37_y=conv2(pramod37_x,pramod37_h)
disp(pramod37_y,"2D Linear Convolution result: y=")
```

Output:

```
pramod37_x=

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

pramod37_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;
pramod37_x = [1,2;3,4];
pramod37_h = [5,6;7,8];
disp(pramod37_x,"pramod37_x=")
disp(pramod37_h,"pramod37_h=")
pramod37_X = fft2(pramod37_x)
pramod37_H = fft2(pramod37_h)
Y=pramod37_X.*pramod37_H
pramod37_y = ifft(Y)
disp(pramod37_y,"2D Circular Convolution result: y=")
```

Output:

```
pramod37_x=

   1.    2.
   3.    4.

pramod37_h=

   5.    6.
   7.    8.

2D Circular Convolution result: y=

   70.    68.
   62.    60.
```

Example 2

Code:

```
clc;
pramod37_x = [1,2,3;4,5,6;7,8,9];
pramod37_h = [1,1,1;1,1,1;1,1,1];
disp(pramod37_x,"pramod37_x=")
disp(pramod37_h,"pramod37_h=")
pramod37_X = fft2(pramod37_x)
pramod37_H = fft2(pramod37_h)
Y=pramod37_X.*pramod37_H
pramod37_y = ifft(Y)
disp(pramod37_y,"2D Circular Convolution result: y=")
```

Output:

```
pramod37_x=

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

pramod37_h=

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

2D Circular Convolution result: y=

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