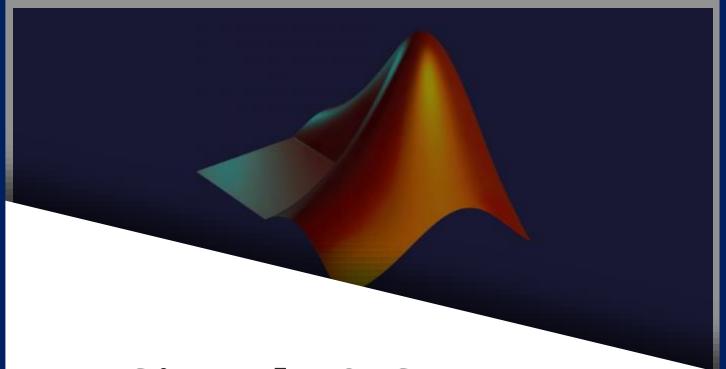
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Signals & Systems Lab (1) Report

By

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A) Printing the New Salary after calculating it.

Problem 2

A) Printing the New Vector after putting -1 in the place of evens and 1 in the place of odds .

```
>> Problem2

Newvector =

-1 -1 1 1 1 -1 -1 1
```

```
Problem3.m × +
1
         %Original Vector
2
3
         V=[ 1;2;3;4;5;6;7;8;];
4
5
         %Remove Comments For the Results
6
         V(end-2:end) = V(end-2:end) + 2;
8
9
10
         %V(end-3:end) = V(end:-1:end-3);
11
12
         V(2:2:end) = V(2:2:end) + V(1:2:end-1);
13
```

A) The First Vector after applying the indexing technique.

```
>> Problem3
>> V

V =

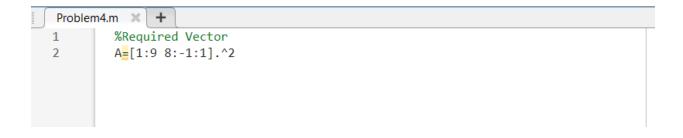
1
2
3
4
5
8
9
10
```

B) The Second Vector after applying the indexing technique.

C)The Third Vector after applying the same indexing technique.



Problem 4



A) The Result of the required Vector



A) Reflect array (M) left-side right

$$M = \begin{bmatrix} 1 & 2 & 3 & 4 \\ -1 & -2 & -3 & -4 \\ 1 & 2 & 3 & 4 \\ -1 & -2 & -3 & -4 \end{bmatrix}$$

$$M = \begin{bmatrix} 4 & 3 & 2 & 1 \\ -4 & -3 & -2 & -1 \\ 4 & 3 & 2 & 1 \\ -4 & -3 & -2 & -1 \end{bmatrix}$$

E) Shuffle the rows of (M) from [1 2 3 4] to [1 3 4 2] and shuffle the columns of (M) from [1 2 3 4] to [3 2 4 1].

M =

$$M =$$

```
problem_6.m * +

1 - x=[1:5; zeros(3,5); -1:-1:-5]'

2 - y=x'

3 - z=[x(1:3,:); x(2:-1:1,:)]'

4 - w=[x(:,1)*2 x(:,2:4)+100 x(:,5)/-10]
```

Generate Matrix x:

Matrix y:

Matrix z:

-3

-2

-1

-2

z =

-1

Matrix w:

```
w =
   2.0000
           100.0000 100.0000
                              100.0000
                                          0.1000
                                          0.2000
   4.0000
           100.0000 100.0000
                              100.0000
                                          0.3000
   6.0000 100.0000 100.0000
                              100.0000
   8.0000 100.0000 100.0000
                              100.0000
                                          0.4000
   10.0000 100.0000 100.0000
                              100.0000
                                          0.5000
```

Problem 7

Part 1

A) Use the 'zeros' function to create an empty 5 -by-5 matrix (A) for the coefficients and an empty 5 -by-1 column vector (B) for the RHSs of the equations.

```
Command Window

>>> problem_7

A=zeros(5)

2 - B=zeros(5,1)

3
4

B = 

0 0 0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
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0 0 0 0
```

B) Use the array editor to populate the coefficients into matrix (A).

A ×						
☐ 5x5 double						
	1	2	3	4	5	6
1	2	3	5	6	21	
2	5	0	3	2	0	
3	6	7	8	9	11	
4	13	0	17	5	6	
5	1	4	0	3	9	
6						
7						
8						

C) Use the command prompt to populate the RHSs into vector (B).

```
Command Window

B =

0
0
0
0
0
0
0

>> B=[152; 19; 135; 127; 66]

B =

152
19
135
127
66
```

- D) we can use the 'rank' function to find out whether or not the 5 equations are "independent" enough to assign unique solutions for the 5 unknowns, by Comparing the rank & the number of unknowns.

 If the rank is equal to 5, it means that the system of equations has a unique solution. If the rank is less than 5, the equations are dependent, and the system may have infinite solutions or the system is inconsistent.
- E) Write down an expression for a variable S that is true if the rank of (A) is equal to the number of variables in the case above and false otherwise.

By using size(A, dim), where A is the matrix and dim specifies the dimension which is 2D Matrix.

```
1 - A=zeros(s)
2 - B=zeros(5,1)
3 - A=[2 3 5 6 21; 5 0 2 2 0; 6 7 8 9 11; 0 13 17 5 6; 1 4 0 3 9]
4
5 - B=[152; 19; 135; 127; 66]
6
7 - S = (rank(A) == size(A, 2))
8
9
|

Command Window
0 13 1/ 5 0
1 4 0 3 9

B =

152
19
135
127
66

S =

logical
```

F) Solve the set of linear equations for x₁ through x₅.

AX=B

X=inverse of A * B

```
problem_7.m × +
1 -
      A=zeros(5)
2 -
       B=zeros(5,1)
      A=[2 3 5 6 21; 5 0 2 2 0; 6 7 8 9 11; 0 13 17 5 6; 1 4 0 3 9]
3 -
4
5 -
      B=[152; 19; 135; 127; 66]
6
7 -
      S = (rank(A) == size(A, 2))
8
9 -
      X=inv(A)*B
Command Windo
       66
   S =
     <u>logical</u>
       1.0000
       2.0000
       3.0000
       4.0000
       5.0000
```

Part (2)

Use the Matlab help system to find the names:

1. The exponential function

2. A function that returns the natural logarithm

```
problem_7.m × +
       B=zeros(5,1)
       A=[2 3 5 6 21; 5 0 2 2 0; 6 7 8 9 11; 0 13 17 5 6; 1 4 0 3 9]
3 -
       B=[152; 19; 135; 127; 66]
5 -
      S = (rank(A) == size(A, 2))
9 -
      X=inv(A)*B
      help exp
2 -
      help log
ommand Window
      exp(X) is the exponential of the elements of X, e to the X.
      For complex Z=X+i*Y, exp(Z) = exp(X)*(COS(Y)+i*SIN(Y)).
      See also expm1, loq, loq10, expm, expint.
      Reference page for exp
      Other functions named exp
  log Natural logarithm.
      log(X) is the natural logarithm of the elements of X.
      Complex results are produced if X is not positive.
      See also \underline{\text{log1p}}, \underline{\text{log2}}, \underline{\text{log10}}, \underline{\text{exp}}, \underline{\text{logm}}, \underline{\text{reallog}}.
      Reference page for log
      Other functions named log
```

3. Functions that return the base-2 and base-10 logarithms

```
Command Window
log2    Base 2 logarithm and dissect floating point number.
    Y = log2(X) is the base 2 logarithm of the elements of X.

[F,E] = log2(X) for each element of the real array X, returns an array F of real numbers, usually in the range 0.5 <= abs(F) < 1, and an array E of integers, so that X = F .* 2.^E. Any zeros in X produce F = 0 and E = 0. This corresponds to the ANSI C function frexp() and the IEEE floating point standard function logb().

See also log, log10, pow2, nextpow2, realmax, realmin.

Reference page for log2
Other functions named log2

log10    Common (base 10) logarithm.
log10(X) is the base 10 logarithm of the elements of X.
Complex results are produced if X is not positive.</pre>
```

4. A function that gets the square root of a number

sqrt Square root.

sqrt(X) is the square root of the elements of X. Complex
results are produced if X is not positive.

See also sqrtm, realsqrt, hypot.

5. "Sound" & "Image" commands

sound Play vector as sound.

<code>sound(Y,FS)</code> sends the signal in vector Y (with sample frequency FS) out to the speaker on platforms that support sound. Values in Y are assumed to be in the range -1.0 <= y <= 1.0. Values outside that range are clipped. Stereo sounds are played, on platforms that support it, when Y is an N-by-2 matrix.

sound(Y) plays the sound at the default sample rate of 8192 Hz.

sound(Y,FS,BITS) plays the sound using BITS bits/sample if
possible. Most platforms support BITS=8 or 16.

Example:

load handel

sound (y, Fs)

You should hear a snippet of Handel's Hallelujah Chorus.

image Display image from array

image(C) displays the data in array C as an image. Each element of C
specifies the color for 1 pixel of the image. The resulting image is an
m-by-n grid of pixels where m is the number of columns and n is the
number of rows in C. The row and column indices of the elements
determine the centers of the corresponding pixels.

When C is a 2-dimensional m-by-n matrix, the elements of C are used as indices into the current COLORMAP to determine the color. The value of the image object's CDataMapping property determines the method used to select a colormap entry. For 'direct' CDataMapping (the default), values in C are treated as colormap indices (1-based if double, 0-based if uint8 or uint16). For 'scaled' CDataMapping, values in C are first scaled according to the axes CLim and then the result is treated as a colormap index. When C is a 3-dimensional m-by-n-by-3 matrix, the elements in C(:,:,1) are interpreted as red intensities, in C(:,:,2) as green intensities, and in C(:,:,3) as blue intensities, and the CDataMapping property of image is ignored. For matrices containing doubles, color intensities are on the range [0.0, 1.0]. For uint8 and uint16 matrices, color intensities are on the range [0, 255].

image(C) places the center of element C(1,1) at (1,1) in the axes, and
the center of element (M,N) at (M,N) in the axes, and draws each
rectilinear patch as 1 unit in width and height. As a result, the
outer extent of the image occupies [0.5 N+0.5 0.5 M+0.5] of the axes,
and each pixel center of the image lies at integer coordinates ranging
between 1 and M or N

image(x,y,C) specifies the image location. Use x and y to specify the locations of the corners corresponding to C(1,1) and C(m,n). To specify both corners, set x and y as two-element vectors. To specify the first corner and lot image determine the other set x and y as collaps. Wellows