NPTEL course offered by IIT Madras
Computer methods of analysis of offshore structures

SOLUTION TO ASSIGNMENT - 0

1. This can be solved by using simple commands in command window:

a) Extract the first 2 x 2 sub-matrix from [A]

```
>> A=[1 2 1; 4 1 3; 1 7 5];
>> B=[1 -1 1; 5 0 -3; 1 2 -4];
>> A(1:2,1:2)

ans =

     1     2
     4     1
```

b) Replace the first 2 x 2 sub-matrix of [A] by first 2 x 2 matrix of [B]

```
>> A=[1 2 1; 4 1 3; 1 7 5];
B=[1 -1 1; 5 0 -3; 1 2 -4];
>>  A(1:2,1:2)=B(1:2,1:2);
>> A

A =

     1    -1     1
     5     0     3
     1     7     5
```

c) A^TB

```
>> A=[1 2 1; 4 1 3; 1 7 5];
B=[1 -1 1; 5 0 -3; 1 2 -4];
>> A'

ans =

     1     4     1
     2     1     7
     1     3     5

>> A'*B

ans =

    22     1   -15
    14    12   -29
    21     9   -28
```

d) A/B

```
>> A/B

ans =

  -50.0000   15.0000  -24.0000
  -71.0000   22.0000  -35.0000
 -175.0000   52.0000  -84.0000
```

e) Element wise multiplication of [A] and [B]

```
>> A.*B

ans =

     1    -2     1
    20     0    -9
     1    14   -20
```

f) Delete second row and second column of [B] and form a 2 x 2 matrix

```
>> B=[1 -1 1; 5 0 -3; 1 2 -4];
>> B(2,:)=[];
>> B(:,2)=[];
>> B

B =

     1     1
     1    -4
```

2. Write a MATLAB program to solve a system of equations given below:

Solution:

a) x = 1, y = 1.5, z = 0.5

Explanation:

Frame the equation in matrix form as follows:

$$\begin{bmatrix} 4 & 3 & 1 \\ 1 & -4 & 10 \\ 2 & 3 & -5 \end{bmatrix} \begin{Bmatrix} x \\ y \\ z \end{Bmatrix} = \begin{Bmatrix} 9 \\ 0 \\ 4 \end{Bmatrix}$$

$$\begin{Bmatrix} x \\ y \\ z \end{Bmatrix} = \begin{bmatrix} 4 & 3 & 1 \\ 1 & -4 & 10 \\ 2 & 3 & -5 \end{bmatrix}^{-1} \begin{Bmatrix} 9 \\ 0 \\ 4 \end{Bmatrix}$$

Program:

```
clc;
clear;
%% Program to solve equations
A = [4 3 1; 1 -4 10; 2 3 -5];
B = [9; 0; 4];
X = inv(A)*B;
disp (X);
```

Output:

```
 1.0000
 1.5000
 0.5000
```

b) **x = 2, y = -1, z = 4, s = 3, t = 7**

Follow the same procedure given in 2(a).

Program:

```
%% Program to solve equations 2(b)
A = [4 3 3 -6 7; 2 2 1 4 -1; 1 3 -5 1 -4; 2 4 -1 -1 0; 3 -2 1 0 -1];
B = [48; 11; -46; -7; 5];
X = inv(A)*B;
disp (X);
```

Output:

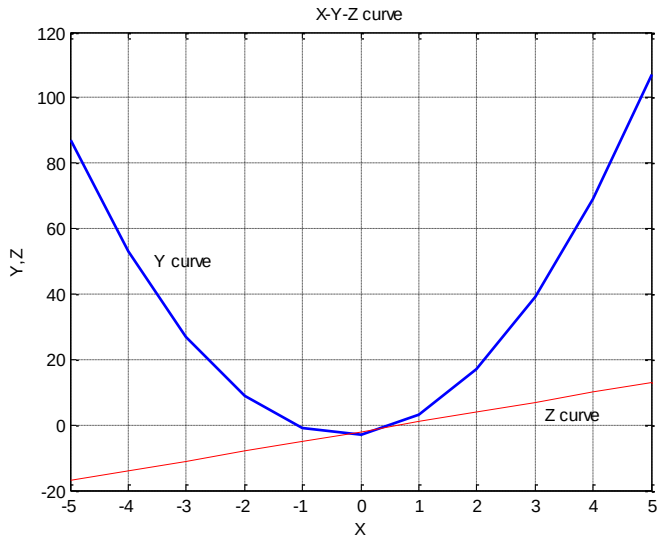
```
 2.0000
-1.0000
 4.0000
 3.0000
 7.0000
```

3. Program for curves plot:

Program:

```
%% Curve plot (3)
% Input
x = -5:5;
y = (4*(x.^2)) + (2*x) - 3;
z = (3*x) - 2;
% Plot
plot(x,y,'b','linewidth',2); % y curve
hold on;
plot(x,z,'r','linewidth',1); % z curve
grid on;
xlabel('X');
ylabel('Y,Z');
title('X-Y-Z curve');
gtext('Y curve'); % text is added to the plot by mouse click
gtext('Z curve');
```

Output:



4. Sum of elements in vector:

Program:

```
%% sum of elements
A = [2 5 7 4 5 6 9 5 1 7 5 3];
n = length(A);% to find the number of elements in vector
s = 0;
for i=1:n
    s = s+A(i);
end
average = s/n;
fprintf ('Sum: %6.2f \n',s);
fprintf ('Average: %6.3f \n',average);
```

Output:

```
Sum:  59.00
Average:  4.917
```

5. Mapping of matrix:

Program 1:

```
%% mapping method 1
A = [1 0 2; 6 4 5; 1 9 6];
B = zeros(12);
B(1:3,1:3) = A;
B(4:6,4:6) = A;
B(7:9,7:9) = A;
B(10:12,10:12) = A;
disp (B);
```

Output1:

```
1     0     2     0     0     0     0     0     0     0     0     0
6     4     5     0     0     0     0     0     0     0     0     0
1     9     6     0     0     0     0     0     0     0     0     0
0     0     0     1     0     2     0     0     0     0     0     0
0     0     0     6     4     5     0     0     0     0     0     0
0     0     0     1     9     6     0     0     0     0     0     0
0     0     0     0     0     0     1     0     2     0     0     0
0     0     0     0     0     0     6     4     5     0     0     0
0     0     0     0     0     0     1     9     6     0     0     0
0     0     0     0     0     0     0     0     0     1     0     2
0     0     0     0     0     0     0     0     0     6     4     5
0     0     0     0     0     0     0     0     0     1     9     6
```

Program 2:

```
%% mapping method 2
A = [1 0 2; 6 4 5; 1 9 6];
B = zeros(12);
n = length (A);
for i=1:n
    for j=1:n
        B(i,j) = A(i,j);
        B(i+3,j+3) = A(i,j);
        B(i+6,j+6) = A(i,j);
        B(i+9,j+9) = A(i,j);
    end
end
disp (B);
```

Output2:

```
1     0     2     0     0     0     0     0     0     0     0     0
6     4     5     0     0     0     0     0     0     0     0     0
1     9     6     0     0     0     0     0     0     0     0     0
0     0     0     1     0     2     0     0     0     0     0     0
0     0     0     6     4     5     0     0     0     0     0     0
0     0     0     1     9     6     0     0     0     0     0     0
0     0     0     0     0     0     1     0     2     0     0     0
0     0     0     0     0     0     6     4     5     0     0     0
0     0     0     0     0     0     1     9     6     0     0     0
0     0     0     0     0     0     0     0     0     1     0     2
0     0     0     0     0     0     0     0     0     6     4     5
0     0     0     0     0     0     0     0     0     1     9     6
```