MATLAB ASSIGNMENT-4

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Q. SOLVE THE FOLLOWING USING GAUSS ELIMINIATION AND BACK SUBSITUTION:

1. A = [1 1 1;2 1 3;3 4 -2];
b = [4;7;9];

```
%GAUSS ELIMINATION
A = [1 1 1;2 1 3;3 4 -2];
b = [4;7;9];
Ab=[A, b]
```

```
Ab=

     1     1     1     4
     2     1     3     7
     3     4    -2     9
```

```
A\b
     1.000
     2.000
     1.000
```

```
%with A(1,1) as pivot
alpha = Ab(2,1)/Ab(1,1);
Ab(2,:) = Ab(2,:) - alpha*Ab(1,:);
alpha = A(3,1)/A(1,1);
Ab(3,:) = Ab(3,:) - alpha*Ab(1,:)
```

```
Ab =

     1     1     1     4
     0    -1     1    -1
     0     1    -5    -3
```

```
%with A(2,2) as pivot element
alpha = Ab(3,2)/Ab(2,2);
Ab(3,:) = Ab(3,:) - alpha*Ab(2,:)
```

```
Ab =
     1     1     1     4
     0    -1     1    -1
     0     0    -4    -4
```

```
%back substitution
x=zeros(3,1);
x(3)=Ab(3,end)/Ab(3,3);
x(2)=(Ab(2,end)-Ab(2,3)*x(3))/Ab(2,2);
x(1)=(Ab(1,end)-(Ab(1,3)*x(3)+Ab(1,2)*x(2)))/Ab(1,1);
disp(x)
     1
     2
     1
```

2. EQUATION 1: 2*x + y + z = 2; EQUATION 2: -x + y - z = 3; EQUATION 3: x + 2*y + 3*z = -10;

```
%gauss elimination
syms x y z
eqn1 = 2*x + y + z == 2;
eqn2 = -x + y - z == 3;
eqn3 = x + 2*y + 3*z == -10;
[A,B] = equationsToMatrix([eqn1, eqn2, eqn3], [x, y, z])


A =
 2, 1,  1
-1, 1, -1
 1, 2,  3
B =
  2
  3
-10

AB=[A, B]
Ab =
     2     1     1     2
    -1     1    -1     3
     1     2     3   -10

A\B
ans =
            3
            1
           -5

%with A(1,1) as pivot
alpha = AB(2,1)/AB(1,1);
AB(2,:) = AB(2,:) - alpha*AB(1,:);
alpha = A(3,1)/A(1,1);
AB(3,:) = Ab(3,:) - alpha*AB(1,:)
AB =

2   1    1     2
0  3/2  -1/2   4
0  3/2   5/2 -11

%with A(2,2) as pivot element
alpha = AB(3,2)/AB(2,2);
AB(3,:) = AB(3,:) - alpha*AB(2,:)
AB =
2   1     1     2
0   3/2  -1/2   4
0   0     3    -15
```

2. EQUATION 1: 2x+y+3z=4; EQUATION 2: -3x-y-4z=5; EQUATION 3: x+y+2z=0;

```
%gauss elimination
syms x y z
eqn1 = 2*x + y + 3*z == 4;
eqn2 = -3*x - y - 4*z == 5;
eqn3 = x + y + 2*z == 0;
[A,B] = equationsToMatrix([eqn1, eqn2, eqn3], [x, y, z])
A =
[ 2,  1,  3]
[-3, -1, -4]
[ 1,  1,  2]
B =
4
5
0
AB=[A, B]
AB =

[ 2,  1,  3, 4]
[-3, -1, -4, 5]
[ 1,  1,  2, 0]

%with A(1,1) as pivot
alpha = AB(2,1)/AB(1,1);
AB(2,:) = AB(2,:) - alpha*AB(1,:);
alpha = A(3,1)/A(1,1);
AB(3,:) = AB(3,:) - alpha*AB(1,:)


AB =
[2,   1,   3,  4]
[0, 1/2, 1/2, 11]
[0, 1/2, 1/2, -2]

%with A(2,2) as pivot element
alpha = AB(3,2)/AB(2,2);
AB(3,:) = AB(3,:) - alpha*AB(2,:)


AB =
[2,   1,   3,   4]
[0, 1/2, 1/2,  11]
[0,   0,   0, -13]
```

4. 5x1+4x2+2x3=6
−3x1+3x2+x3=−4
2x1+2x2−4x3=2

```
syms x1 x2 x3
eqn1 = 5*x1+4*x2+2*x3 == 6;
eqn2 = -3*x1+3*x2+x3 == -4;
eqn3 = 2*x1+2*x2-4*x3 == 2;
[A,B] = equationsToMatrix([eqn1, eqn2, eqn3], [x1, x2, x3])
```

```
A =
[ 5, 4,  2]
[-3, 3,  1]
[ 2, 2, -4]

B =
 6
-4
 2
```

```
AB=[A,B]

AB =
[ 5, 4,  2,  6]
[-3, 3,  1, -4]
[ 2, 2, -4,  2]

%with A(1,1) as pivot
alpha = AB(2,1)/AB(1,1);
AB(2,:) = AB(2,:) - alpha*AB(1,:);
alpha = A(3,1)/A(1,1);
AB(3,:) = AB(3,:) - alpha*AB(1,:)

AB =
[5,    4,     2,    6]
[0, 27/5,  11/5, -2/5]
[0,  2/5, -24/5, -2/5]

%with A(2,2) as pivot element
alpha = AB(3,2)/AB(2,2);
AB(3,:) = AB(3,:) - alpha*AB(2,:)

AB =
[5,    4,       2,      6]
[0, 27/5,    11/5,   -2/5]
[0,    0, -134/27, -10/27]
```