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STUDENT NUMBER: 17330208

Please indicate your answers by entering the option ((i), (ii), (iii) or (iv)) where asked. You should append the completed document as a pdf with your typewritten worked solutions including MATLAB code) and upload to Blackboard.

Q 4.23

(i)

L =

1.5000	0	0	0
-2.0000	1.0000	0	0
0.5000	1.0000	1.5000	0
-2.0000	3.5000	-0.5000	1.0000

U =

4.0000	-1.0000	3.0000	2.0000
0	-1.0000	3.0000	0.5000
0	0	2.0000	1.0000
0	0	0	3.0000

(ii)

L =

1.0000	0	0	0
-2.0000	1.0000	0	0
0.5000	1.5000	1.0000	0
-2.0000	3.0000	-0.5000	1.0000

U =

4.0000	-1.0000	3.0000	2.0000
0	-2.0000	3.0000	0.5000
0	0	4.0000	2.0000
0	0	0	3.0000

(iii)

L =

1.5000	0	0	0
-2.0000	1.0000	0	0
0.5000	1.0000	1.0000	0
-2.0000	2.0000	-0.5000	1.0000

U =

3.0000	-1.5000	3.0000	2.0000
0	-2.0000	3.0000	0.5000
0	0	4.0000	2.5000
0	0	0	1.0000

(iv)

L =

1.5000	0	0	0
-2.0000	1.5000	0	0
0.5000	1.5000	1.5000	0
-2.0000	3.0000	-0.5000	1.5000

U =

4.0000	-1.0000	3.0000	2.0000
0	-2.0000	3.0000	0.5000
0	0	4.0000	2.0000
0	0	0	2.0000

Your Answer ((i) – (iv)): (ii)

Q 5.17

You need only to indicate the best team and the worst team (from teams 1 to 6).

Your Answers: **Best** 2&5 **Worst** 1

Q 6.3

(i) $b = 4.6831 \times 10^{-8}, \quad m = 0.022, \quad population(1985) = 1014\ million$
(ii) $b = 4.8932 \times 10^{-8}, \quad m = 0.022, \quad population(1985) = 1024\ million$
(iii) $b = 4.6931 \times 10^{-8}, \quad m = 0.012, \quad population(1985) = 1038\ million$
(iv) $b = 4.9932 \times 10^{-8}, \quad m = 0.014, \quad population(1985) = 1042\ million$

Your Answer ((i)-(iv)): (iv)

Computational Mathematics Assignment 1

Student name: Davy Nolan
Student number: 17330208

Q 4.23

Matlab code:

```
function [L,A]=LUdecompGauss(A)
[m,n] = size(A);
L=eye(n);
for k=1:n
    if (A(k,k) == 0)
        Error('Pivot required');
    end
    L(k+1:n,k)=A(k+1:n,k)/A(k,k);
    for j=k+1:n
        A(j,:)=A(j,:)-L(j,k)*A(k,:);
    end
end
```

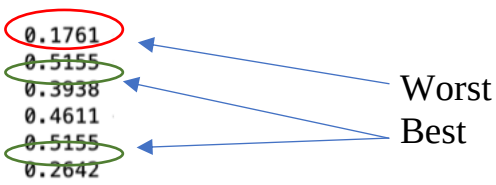
```
>> A = [4 -1 3 2; -8 0 -3 -3.5; 2 -3.5 10 3.75; -8 -4 1 -0.5];
>> [l,a] = LUdecompGauss(A)

l =

    1.0000         0         0         0
   -2.0000    1.0000         0         0
    0.5000    1.5000    1.0000         0
   -2.0000    3.0000   -0.5000    1.0000


a =

    4.0000   -1.0000    3.0000    2.0000
         0   -2.0000    3.0000    0.5000
         0         0    4.0000    2.0000
         0         0         0    3.0000
```

5.17 (a)

```
>> A = [0 0 0 1 0 0 ; 1 0 1 0 1 1; 0 1 0 0 1 0; 1 1 0 0 1 0; 1 1 1 0 0 1; 1 0 0 0 1 0];
>> [V,D] = eig(A)

V =

  Columns 1 through 5

    0.1761    0.3379    0.0000   -0.5773   -0.5773
    0.5155   -0.1443    0.0000   -0.0000   -0.0000
    0.3938   -0.7555   -0.7071    0.0000    0.0000
    0.4611    0.1290    0.0000    0.5774    0.5774
    0.5155   -0.1443   -0.0000   -0.0000   -0.0000
    0.2642    0.5068    0.7071    0.5773    0.5773

  Column 6

    0.5774
   -0.0000
    0.0000
   -0.5773
   -0.0000
   -0.5774


D =

  Columns 1 through 5

    2.6180         0         0         0         0
         0    0.3820         0         0         0
         0         0         0         0         0
         0         0         0   -1.0000         0
         0         0         0         0   -1.0000
         0         0         0         0         0

  Column 6

         0
         0
         0
         0
         0
   -1.0000
```

(b)

Eigen vector =



6.3 The following data give the approximate population of China for selected years from 1900 until 2010:

Year	1900	1950	1970	1980	1990	2000	2010
Population (millions)	400	557	825	981	1135	1266	1370

Assume that the population growth can be modeled with an exponential function $p = be^{mx}$, where x is the year and p is the population in millions. Write the equation in a linear form (Section 6.3), and use linear least-squares regression to determine the constants b and m for which the function best fits the data. Use the equation to estimate the population in the year 1985.

p = be^(mx)

Linear form:
ln(p) = mx + ln(b)

Step 1: for each (x,y) calculate x^2 and xy:

x	y	x^2	xy
1900	400	3,610,000	760,000
1950	557	3,802,500	1,086,150
1970	825	3,880,900	1,625,250
1980	981	3,920,400	1,942,380
1990	1135	3,960,100	2,258,650
2000	1266	4,000,000	2,532,000
2010	1370	4,040,100	2,753,700

Step 2: Sum x, y, x^2 and xy (gives us Σx, Σy, $Σx^2$ and Σxy):

Σx : 13,800 Σy: 6534 Σ(x^2):27,214,000 Σ(xy): 12,958,130

N(number of data values) = 7

Step 3: Calculate slope m:

$$\mathbf{m} = \frac{N\,\Sigma(xy) - \Sigma x\,\Sigma y}{N\,\Sigma(x^2) - (\Sigma x)^2}$$

((7 * 12,958,130) – (13800 * 6534)) / ((7 * 27,214,000) –((13,800)^2))

= 537,710 / 58,000 = **9.270862 = m**

Step 4: Calculate intercept b:

$$b = \frac{\Sigma y - m \Sigma x}{N}$$

(6534 – (9.27…)(13800)) / 7 = - 17,343.41379

y = 9.27086*X* - 17343.41379