By Bajrang

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Section 1

Question 1

Code

```
// Bajrang 363
// Section 1 Question 1

A = [5,2,4; 1,7,-3; 6,-10,0];
disp(A, "A = ")
B = [11,5,-3; 0,-12,4; 2,6,1];
disp(B, "B = ")
C = [7,14,1; 10,3,-2; 8,-5,9];
disp(C, "C = ")

// Part A

dA = det(A)
dB = det(B)
dC = det(C)

disp(dA,"Determinant of A = ")
disp(dB, "Determinant of B = ")
disp(dC, "Determinant of C = ")

// Part B
solb1 = (A+B)*C;
solb2 = 5*A+B*C;

disp(solb1, "(A+B)C = ")
disp(solb2, "5A+BC = ")

// Part C
ab = A*B;
ba = B*A;

disp(ab, "A*B = ")
disp(ba, "B*A = ")
```

```
if ab==ba then
    disp("A*B and B*A are equal.");
else
    disp("A*B and B*A are not equal.");
end

// Part D
adc = A/C;
cda = A\C;

disp(adc, "A/C = ")
disp(cda, "A\C = ")

// Part E
abt = (A*B)'
atbt = (A')*(B')
bat = (B*A)'

disp(abt,"(AB)t = ")
disp(atbt, "AtBt = ")
disp(bat, "(BA)t = ")

if abt == atbt & abt ~=  bat then
    disp("(AB)t = (A)t(B)t != (BA)t");
elseif abt == atbt & abt == bat then
    disp("(AB)t = (A)t(B)t = (BA)t");
else
    disp("(AB)t != (A)t(B)t = (BA)t");
end

// Part F
At = A';
Bt = B';

atpbt = At + Bt;
apbt = (A + B)';

if atpbt == apbt then
    disp("(A)t + (B)t = (A+B)t")
    disp(At,"(A)t = ")
    disp(Bt, "(B)t = ")
end

// Part G
if dA ~= 0 then
    disp("A is invertible")
```

```scilab
        disp(inv(A), "A inverse is ")
    else
        disp("A is not invertible.")
    end

    if dB ~= 0 then
        disp("B is invertible")
        disp(inv(B), "B inverse is ")
    else
        disp("B is not invertible.")
    end

    if dC ~= 0 then
        disp("C is invertible")
        disp(inv(C), "C inverse is ")
    else
        disp("A is not invertible.")
    end

    // Part H
    P = A*C
    Q = A.*C

    disp(P, "P = A*C = ")
    disp(Q, "Q = A.*C = ")
    if P == Q then
        disp("A*C  = A.*C", "P and Q are equal.")
    else
        disp("P and Q are not equal.")
    end
```

Output

--> exec('C:\Users\Bajrang Lal Bishnoi\OneDrive\Desktop\SEM - III\Scilab\Assignment 3\e2q1.sce', -1)

 A =

   5.   2.   4.

   1.   7.   -3.

6. -10. 0.

B =

11. 5. -3.
0. -12. 4.
2. 6. 1.

C =

7. 14. 1.
10. 3. -2.
8. -5. 9.

Determinant of A =

-394.

Determinant of B =

-428.

Determinant of C =

-1439.

(A+B)C =

190.	240.	11.
-35.	-6.	20.
24.	95.	25.

5A+BC =

128.	194.	-6.
-83.	-21.	45.
112.	-9.	-1.

A*B =

63.	25.	-3.
5.	-97.	22.
66.	150.	-58.

B*A =

42.	87.	29.
12.	-124.	36.
22.	36.	-10.

A*B and B*A are not equal.

A/C =

 0.2939541 -0.0298819 0.4051425

 0.3495483 0.1299514 -0.343294

-0.8075052 0.9284225 0.2960389

A\C =

 2.2385787 0.9390863 0.6497462

 0.5431472 1.0634518 -0.5101523

-1.319797 1.7944162 -0.3071066

(AB)t =

 63. 5. 66.

 25. -97. 150.

 -3. 22. -58.

AtBt =

 42. 12. 22.

 87. -124. 36.

 29. 36. -10.

(BA)t =

42. 12.   22.

87. -124. 36.

29. 36.   -10.

(AB)t != (A)t(B)t = (BA)t

(A)t + (B)t = (A+B)t

(A)t =

5. 1. 6.

2. 7. -10.

4. -3. 0.

(B)t =

11. 0.   2.

5. -12. 6.

-3. 4.   1.

A is invertible

A inverse is

```
0.0761421   0.1015228   0.0862944
0.0456853   0.0609137  -0.0482234
0.1319797  -0.1573604  -0.0837563
```

B is invertible

B inverse is

```
 0.0841121   0.0537383   0.0373832
-0.0186916  -0.0397196   0.1028037
-0.0560748   0.1308411   0.3084112
```

C is invertible

C inverse is

```
-0.0118138   0.0910354   0.0215427
 0.0736623  -0.038221   -0.0166782
 0.0514246  -0.1021543   0.0826963
```
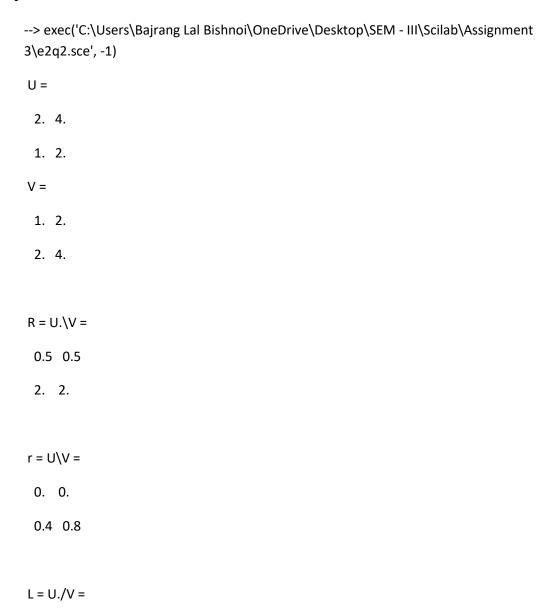
P = A*C =

```
87.  56.  37.
```

53. 50. -40.

-58. 54. 26.

Q = A.*C =

35. 28. 4.

10. 21. 6.

48. 50. 0.

P and Q are not equal.

Question 2

Code

```
// Bajrang 363
// Section 1 Question 02

U = [2,4; 1,2];
V = [1,2; 2,4];

disp(U, "U = ")
disp(V, "V = ")

// part a
R = U.\V;
r = U\V;
L = U./V

disp(R, "R = U.\V = ")
disp(r, "r = U\V = ")
disp(L, "L = U./V = ")

if R == L then
    disp("R and L are equal.")
else
    disp("R and L are not equal")
end
```

Output

U =

  2. 4.

  1. 2.

V =

  1. 2.

  2. 4.

R = U.\V =

 0.5 0.5

  2.   2.

r = U\V =

  0.   0.

 0.4 0.8

L = U./V =

  2.   2.

 0.5 0.5

R and L are not equal

Question 3

Code

```
// Bajrang 363
// Section 1 Question 3

U = [3,11,6; 4,7,10; 13,9,8];
sm_c = 0.5*(U + U');
asm_c = 0.5*(U - U');

disp(U, "U = ")
disp(U', "U Transpose = ")
disp(sm_c, "Symmetric Matrix (sm_c) = ")
disp(asm_c, "Asymmetric Matrix (asm_c) = ")

if U == sm_c + asm_c then
    disp("U = sm_c + asm_c")
end
```

Output

--> exec('C:\Users\Bajrang Lal Bishnoi\OneDrive\Desktop\SEM - III\Scilab\Assignment 3\e2q3.sce', -1)

U =

  3.   11.   6.

  4.   7.   10.

  13.   9.   8.

U Transpose =

3. 4. 13.

11. 7. 9.

6. 10. 8.

Symmetric Matrix (sm_c) =

3. 7.5 9.5

7.5 7. 9.5

9.5 9.5 8.

Asymmetric Matrix (asm_c) =

0. 3.5 -3.5

-3.5 0. 0.5

3.5 -0.5 0.

U = sm_c + asm_c

Question 4

Code

```
// Bajrang 363
// Section 01 Question 04

// Linear Equations
// 5x+4y-2z+6w = 4
// 3x + 6y + 6z + 4.5w = 13.5
// 6x + 12y − 2z + 16w = 20
// 4x − 2y + 2z − 4w = 6

function [X]=GAUSS_ELIMINATION_METHOD(A, B)
    // Retrieve the size of matrix A and vector B
    [n,n]=size(A)
    [r,s]=size(B)
```

```
    // Check whether the size of A and size of B are compatible
    if (n<>r) then
        disp("Error: Matrix A and Vector B are of incompatible sizes")
    end

    // Create the Augmented Matrix C
    C = [A B]

    // Elementary Elimination Method to reduce the Augmented matrix C..
    // to upper triangular matrix

    for i = 1:n-1
        if C(i,i) < max(abs(C(i+1:n,i))) then
            [p,q] = max(abs(C(i+1:n,i)))
            temp(1,1:n+1) = C(i,1:n+1)
            C(i,1:n+1) = C(i+q,1:n+1)
            C(i+q,1:n+1) = temp(1,1:n+1)
        end
        for j = i+1:n
            m(j,i) = -C(j,i)/C(i,i);
            C(j,:) = C(j,:) + m(j,i) * C(i,:);
        end
    end

    disp(C, "Reduced Row Matrix C=")
    X(n,1) = C(n,n+1)/C(n,n)
    //disp(X, "X=")
    for i = n-1:-1:1
    X(i) = (C(i,n+1)-C(i,i+1:n)*X(i+1:n))/C(i,i)
    end

endfunction

A = [5,4,-2,6; 3,6,6,4.5; 6,12,-2,16; 4,-2,2,-4];
B = [4;13.5;20;6];

X = GAUSS_ELIMINATION_METHOD(A,B);

V = [" x | "; " y | "; " z | "; " w | "];
disp("Answers are ")
mprintf('%s%.2f\n',V,X);
```

Output

--> exec('C:\Users\Bajrang Lal Bishnoi\OneDrive\Desktop\SEM - III\Scilab\Assignment 3\e2q4.sce', -1)

Reduced Row Matrix C=

6.	12.	-2.	16.	20.
0.	-10.	3.3333333	-14.666667	-7.3333333
0.	0.	7.	-3.5	3.5
0.	0.	0.	0.3	-7.1

Answers are

x | -0.67

y | 31.67

z | -11.33

w | -23.67

Question 5

Code

```
// Bajrang 363
// Section 1 Question 05

disp("Magic Matrices are Matrices in which the sum of rows, sum of columns and sum of
diagonal are equal.")

M = testmatrix('magi', 4);
disp(M, "Magic matrix M = ")

Sr = sum(M, 'r');
Sc = sum(M, 'c');
Sd = trace(M);

disp(Sr, "Sum of row elements = ")
disp(Sc, "Sum of column elements  = ")
disp(Sd, "Sum of Diagonal elements = ")
```

Output

Magic Matrices are Matrices in which the sum of rows, sum of columns and sum of diagonal are equal.

 Magic matrix M =

  16.   2.   3.   13.

  5.   11.   10.   8.

  9.   7.   6.   12.

  4.   14.   15.   1.

Sum of row elements =

  34.   34.   34.   34.

Sum of column elements =

  34.

  34.

  34.

  34.

Sum of Diagonal elements =

  34.

Section 2 : Vector Algebra using SciLab

Code

```
// Bajrang 363
// Section 02 Vector Algebra using SCILAB
```

```scilab
a = [4,9,-5];
b = [-3,6,-7];
c = [2,2,3];

// part a
p = cross(b,c);
disp(p, "p = b*c = ")

// part b
s = a*cross(b,c)';
disp(s, "s = a.[b*c] = ")

// part c
// projection of b on a = a.b/|a|
P = (a*b')/norm(a);
disp(P, "Projection of b on a = ")

// part d
v = cross(a,cross(b,c));
disp(v, "a*(b*c) = ")

// part e
theta = acosd((a*c')/(norm(a)*norm(c)));
disp(theta, "Angle between a and c is ")
```

Output

--> exec('C:\Users\Bajrang Lal Bishnoi\OneDrive\Desktop\SEM - III\Scilab\Assignment 3\e2s2.sce', -1)

 p = b*c =

  32. -5. -18.

 s = a.[b*c] =

  173.

 Projection of b on a =

  6.9712524

 a*(b*c) =

  -187. -88. -308.

Angle between a and c is

76.022574