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```
clc;
clear;
```

Question 1

```
disp(' Question 1')
K = [100, 0, 320;
     0, 100, 240;
     0, 0, 1];
Rwc1 = eye(3);
twc1 = [1, 0, 0]';
Rwc2 = ROTY(pi/2);
twc2 = [0, 0, 1]';
P1 = K*[Rwc1' -Rwc1'*twc1];
P2 = K*[Rwc2' -Rwc2'*twc2];
disp(' P:')
disp(P1)
disp("P' :")
disp(P2)
X = [1, 0, 1, 1]';
x1 = P1*X;
x1 = [x1(1)/x1(3) x1(2)/x1(3) 1]';
x2 = P2*X;
x2 = [x2(1)/x2(3) x2(2)/x2(3) 1]';
disp(' x:')
disp(x1)
disp("x' :")
disp(x2)
C1 = null(P1);
e2 = P2*C1;
e2 = [e2(1)/e2(3) e2(2)/e2(3) 1]';
disp("e' :")
disp(e2)
```

Question 1

P:

100	0	320	-100
0	100	240	0
0	0	1	0

P' :

320.0000		0	-100.0000	100.0000
240.0000	100.0000		0.0000	-0.0000
1.0000		0	0.0000	-0.0000

x:

320
240
1

x' :

320.0000

240.0000
1.0000

e' :
420
240
1

Question 2

```
disp('Question 2')
P_plus = pinv(P1);
F = SKEW3(e2)*P2*P_plus;
F = F/F(3,3);
disp('F:')
disp(F)
a = x2'*F*x1;
disp("Validate F with x'T*F*x=0")
disp("x'T*F*x:")
disp(a)
b = F'*e2;
disp("Validate F with FT*e'=0")
disp("FT*e' :")
disp(b)
```

Question 2

F:

0.0000	0.0000	-0.0016
0.0000	-0.0000	-0.0014
-0.0016	-0.0027	1.0000

Validate F with x'T*F*x=0
x'T*F*x:
-6.5919e-17

Validate F with FT*e'=0
FT*e' :
1.0e-19 *

-0.7793
0
0

Question 3

```
disp('Question 3')
Pc1 = [eye(3) [0,0,0]'];
P1_star = [P1;[0 0 0 1]];
H = inv(P1_star);
disp('H:')
disp(H)
% disp('P1*H:')
% disp(P1*H)
Pc2 = P2*H;
disp("Pc' :")
disp(Pc2)
X_new = H\X;
x3 = Pc1*X_new;
x3 = [x3(1)/x3(3) x3(2)/x3(3) 1]';
```

```

disp('x:')
disp(x3)
x4 = Pc2*X_new;
x4 = [x4(1)/x4(3) x4(2)/x4(3) 1]';
disp("x' :")
disp(x4)
e2_new = Pc2*(H\C1);
e2_new = [e2_new(1)/e2_new(3) e2_new(2)/e2_new(3) 1]';
disp("e' :")
disp(e2_new)

```

Question 3

H:

0.0100	0	-3.2000	1.0000
0	0.0100	-2.4000	0
0	0	1.0000	0
0	0	0	1.0000

Pc' :

1.0e+03 *

0.0032	0	-1.1240	0.4200
0.0024	0.0010	-1.0080	0.2400
0.0000	0	-0.0032	0.0010

x:

320
240
1

x' :

320.0000
240.0000
1.0000

e' :

420.0000
240.0000
1.0000

Question 4

```

disp('Question 4')
PF1 = [eye(3) [0 0 0]'];
% v = [1 2 3]';
% lamda = 5;
e2_star = null(F');
e2_star = [e2_star(1)/e2_star(3) e2_star(2)/e2_star(3) 1]';
disp("e' by null(F) :")
disp(e2_star)
PF2 = [SKEW3(e2_star)*F e2_star];
disp('PF:')
disp(PF1)
disp("PF' :")
disp(PF2)
Pc1_plus = pinv(Pc1);
Fc = SKEW3(e2)*Pc2*Pc1_plus;
Fc = Fc/Fc(3,3);
PF1_plus = pinv(PF1);
Ff = SKEW3(e2_star)*PF2*PF1_plus;
Ff = Ff/Ff(3,3);

```

```
disp("F calculated by (Pc,Pc'):")
disp(Fc)
disp("F calculated by (PF,PF'):")
disp(Ff)
disp("F of Question 1:")
disp(F)
```

Question 4

e' by null(F):

```
420.0000
240.0000
1.0000
```

PF:

```
1    0    0    0
0    1    0    0
0    0    1    0
```

PF' :

```
-0.3750   -0.6563   240.0014   420.0000
0.6562     1.1484  -420.0016   240.0000
0.0027   -0.0016   -0.2266     1.0000
```

F calculated by (Pc,Pc'):

```
0    0.0000   -0.0016
0.0000     0   -0.0014
-0.0016   -0.0027    1.0000
```

F calculated by (PF,PF'):

```
-0.0000    0.0000   -0.0016
0.0000    0.0000   -0.0014
-0.0016   -0.0027    1.0000
```

F of Question 1:

```
0.0000    0.0000   -0.0016
0.0000   -0.0000   -0.0014
-0.0016   -0.0027    1.0000
```