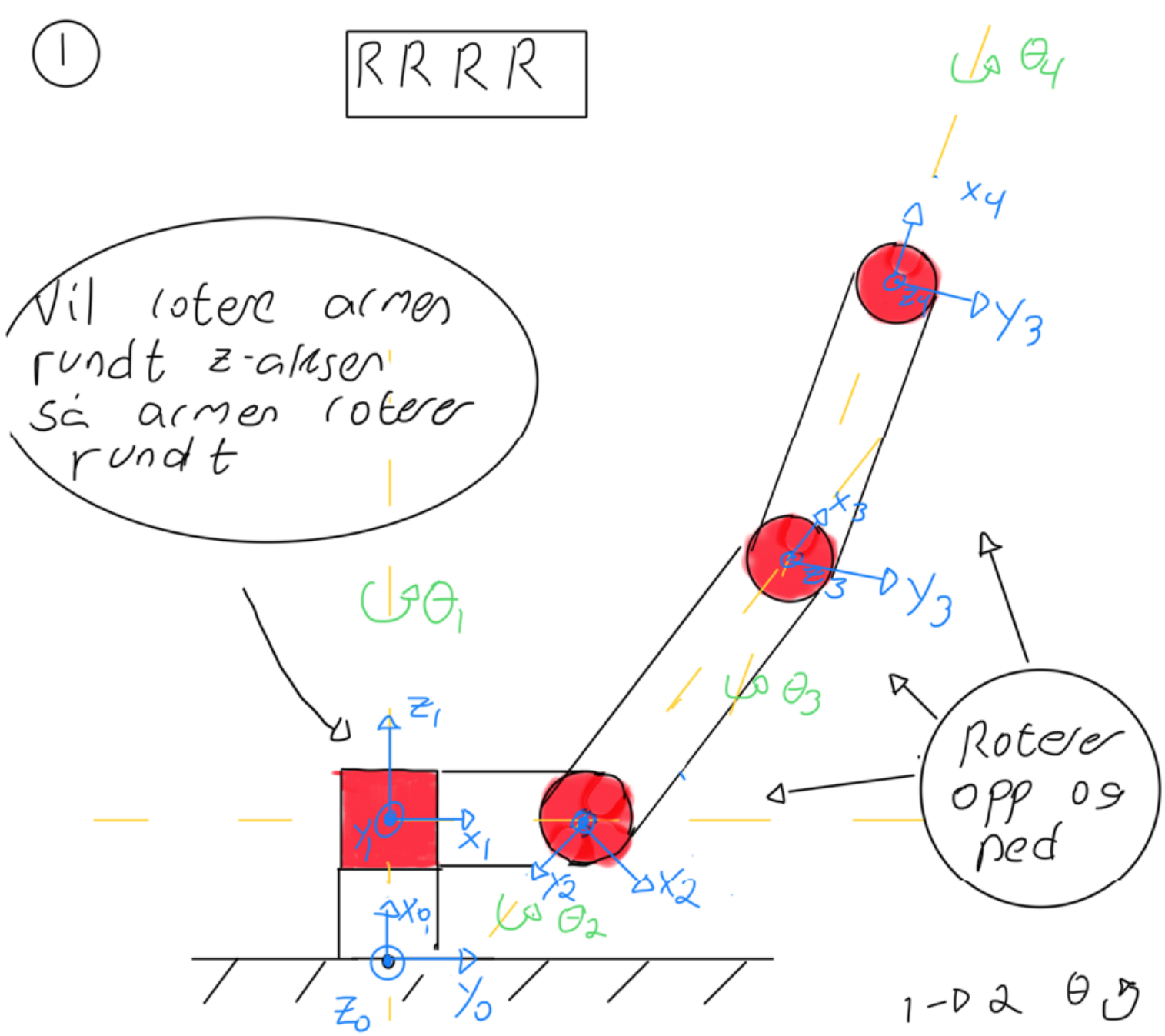
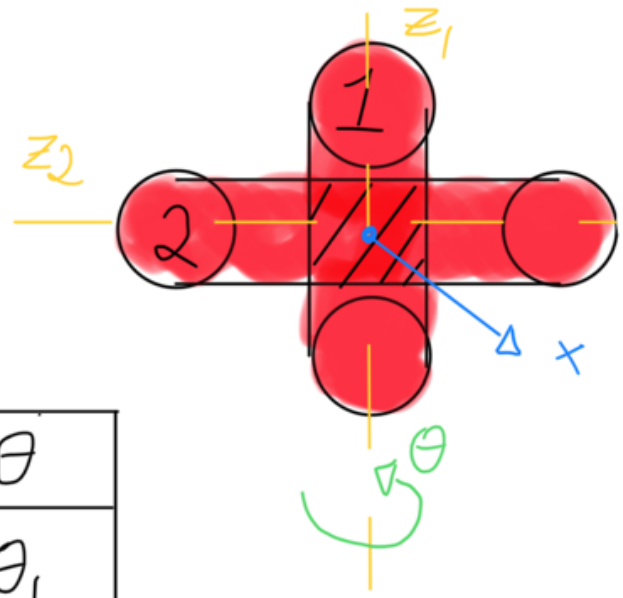
Oblig 3

① RRRR



②



J	a	α	d	θ
1	L_1	$\pi/2$	0	θ_1
2	L_2	0	0	θ_2
3	L_3	0	0	θ_3
4	L_4	0	0	θ_4

$L_1 = 0{,}25$, $L_2 = 0{,}75$, $L_3 = 0{,}75$, $L_4 = 0{,}75$

(3)

$$^{j-1}T_j = \begin{bmatrix} \cos(\theta_j) & -\sin(\theta_j)\cos(\alpha_j) & \sin(\theta_j)\sin(\alpha_j) & a_j\cos(\theta_j) \\ \sin(\theta_j) & \cos(\theta_j)\cos(\alpha_j) & -\cos(\theta_j)\sin(\alpha_j) & a_j\sin(\theta_j) \\ 0 & \sin(\alpha_j) & \cos(\alpha_j) & d_j \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$^{0}T_1 = \begin{bmatrix} \cos(\theta_1) & -0{,}9996\cdot\sin(\theta_1) & 0{,}0274\sin(\theta_1) & 0{,}25\cos(\theta_1) \\ \sin(\theta_1) & 0{,}9996\cos(\theta_1) & -0{,}0274\cdot\cos(\theta_1) & 0{,}25\sin(\theta_1) \\ 0 & 0{,}0274 & 0{,}9996 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$^{1}T_2 = \begin{bmatrix} \cos(\theta_2) & -\sin(\theta_2) & 0 & 0{,}75\cos(\theta_2) \\ \sin(\theta_2) & \cos(\theta_2) & 0 & 0{,}75\cdot\sin(\theta_2) \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

(4)

```
clc;
clear all;

syms q1 q2 q3 q4

L(1) = Link([0,0,0.25,pi/2]);
L(2) = Link([0,0,0.75,0]);
L(3) = Link([0,0,0.75,0]);
L(4) = Link([0,0,0.75,0]);

robot = SerialLink(L)

T = robot.fkine([q1 q2 q3 q4])

vpa(T,4)
```

```
robot =

noname:: 4 axis, RRRR, stdDH, slowRNE
+---+-----------+-----------+-----------+-----------+-----------+
| j |     theta |         d |         a |     alpha |    offset |
+---+-----------+-----------+-----------+-----------+-----------+
|  1|         q1|          0|       0.25|     1.5708|          0|
|  2|         q2|          0|       0.75|          0|          0|
|  3|         q3|          0|       0.75|          0|          0|
|  4|         q4|          0|       0.75|          0|          0|
+---+-----------+-----------+-----------+-----------+-----------+


[ (81129638414606686663546605165575*cos(q1 + q2 + q3 + q4))/162259276829213363391578010288128 + (8112963841460667672803140512
[ (81129638414606686663546605165575*sin(q1 + q2 + q3 + q4))/162259276829213363391578010288128 - (8112963841460667672803140512
[
[

[ 0.5*cos(q2 - 1.0*q1 + q3 + q4) + 0.5*cos(q1 + q2 + q3 + q4), - 0.5*sin(q2 - 1.0*q1 + q3 + q4) - 0.5*sin(q1 + q2 + q3 + q4),
[ 0.5*sin(q1 + q2 + q3 + q4) - 0.5*sin(q2 - 1.0*q1 + q3 + q4),   0.5*cos(q1 + q2 + q3 + q4) - 0.5*cos(q2 - 1.0*q1 + q3 + q4),
[                                          sin(q2 + q3 + q4),                                                  cos(q2 + q3 + q4),
[                                                          0,                                                                  0,

fx >>
```

```
,                                                  sin(q1), 0.375*cos(q1 + q2 + q3) + 0.375*cos(q2 - 1.0*q1 + q3 + q4) + 0.375*cos(q1 - 1.0*q2) + 0.375*cos(q1 + q2 + q3 + q4) + 0.375*cos(q1 + q2)
,                                                 -1.0*cos(q1), 0.375*sin(q1 + q2 + q3) - 0.375*sin(q2 - 1.0*q1 + q3 + q4) + 0.375*sin(q1 - 1.0*q2) + 0.375*sin(q1 + q2 + q3 + q4) + 0.375*sin(q1 + q2)
, 0.00000000000000006123233995727922165564193960254 7,                                                                                                                                                  0.75*sin(q2
,                                                  0,
```

```
 + 0.375*cos(q2 - 1.0*q1 + q3) + 0.25*cos(q1)]
 - 0.375*sin(q2 - 1.0*q1 + q3) + 0.25*sin(q1)]
+ q3 + q4) + 0.75*sin(q2 + q3) + 0.75*sin(q2)]
                                          1.0]
```

5

```
17 -    robot.plot([0,0,0,0])
```