MCE4101 Introduction to Robotics
Quiz1 (5%) –SET 1 (ID end with 0,1,2)-SOLUTION

Name……ID……..
Date: 15 July 2021 (9.15-10.00)
Note:
1. OPEN BOOK.
2. There are 2 questions.
3. 50 Marks equivalent to 5%.

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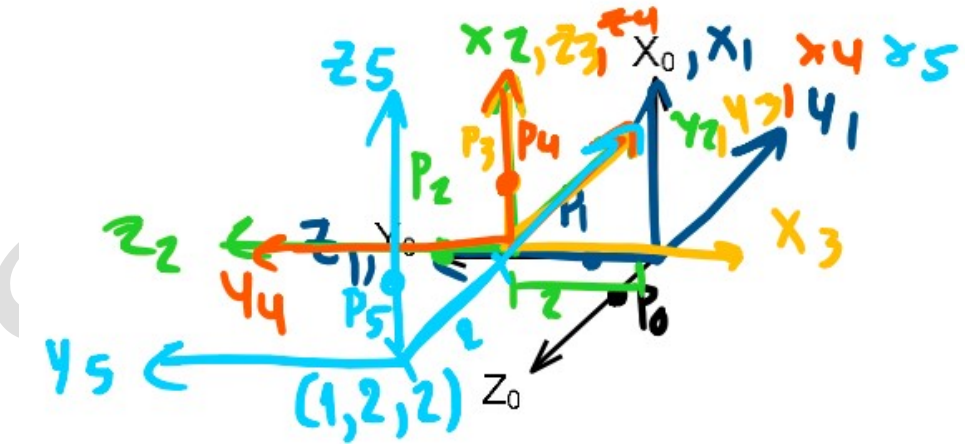
1. (25 Marks). The original frame is given. The following transformation steps for current frames are

i. Rotate -90° in the current x axis then
ii. Translate 2 in the current z axis then
iii. Rotate 90° in the current y axis then
iv. Rotate 90° in the current z axis then
v. Translate -2 in the current x axis

a. (10) List down the all the transformation steps. Find the T_5^0 transformation matrix values.

b. (5) If a point is fixed on the z axis at (0,0,1), obtain the coordinate P_5 with reference to original frame.

c. (10) Plot all the transformation frames and mark P_5 location with reference to origin frame.




```
R01 = rotx(-pi/2);
D12 = transl(0,0,2);
R23 = roty(pi/2);
R34 = rotz(pi/2);
D45 = transl(-2,0,0);
T05_a = r2t(R01)*D12*r2t(R23)*r2t(R34)*D45
```

T05_a =

```
   0.0000   -0.0000    1.0000   -0.0000
        0    1.0000    0.0000    2.0000
  -1.0000         0    0.0000    2.0000
        0         0         0    1.0000
```

P5_a =

```
   1
   2
   2
   1
```

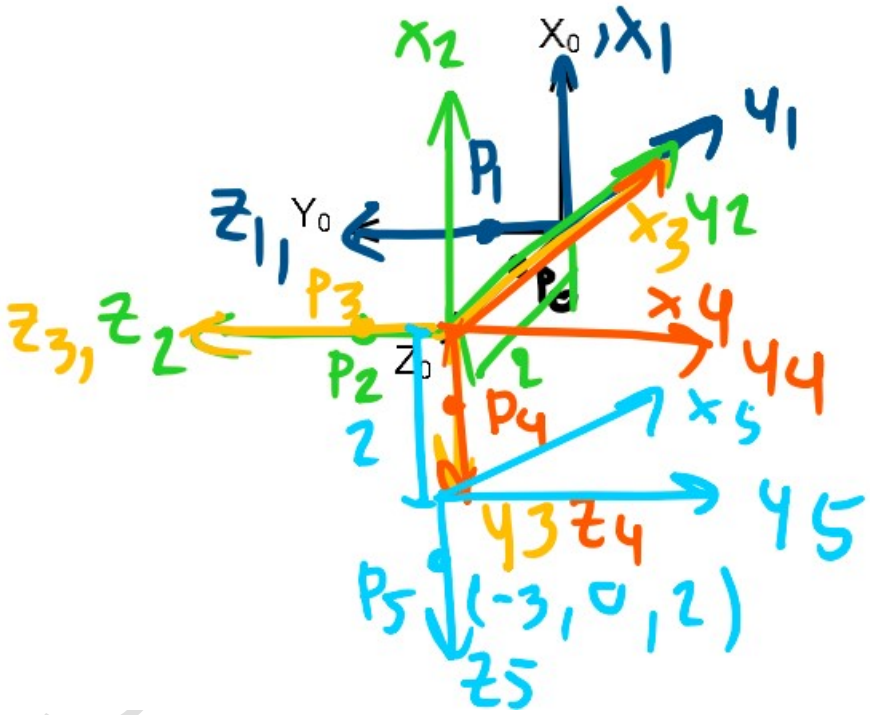
2. (25 Marks). The original frame is given. The following transformation steps for fixed frames are

i. Rotate -90° in the fixed x axis then
ii. Translate 2 in the fixed z axis then
iii. Rotate 90° in the fixed y axis then
iv. Rotate 90° in the fixed z axis then
v. Translate -2 in the fixed x axis

a. (10) List down the all the transformation steps. Find the T_5^0 transformation matrix values.

b. (5) If a point is fixed on the z axis at (0,0,1), obtain the coordinate P_5 with reference to original frame.

c. (10) Plot all the transformation frames and mark P_5 location with reference to origin frame.



```
R01 = rotx(-pi/2);
D12 = transl(0,0,2);
R23 = roty(pi/2);
R34 = rotz(pi/2);
D45 = transl(-2,0,0);
T05_b = (D45*D12)*r2t(R34*R23*R01)
```

T05_b =

0.0000	-0.0000	-1.0000	-2.0000
0.0000	-1.0000	0.0000	0
-1.0000	-0.0000	0.0000	2.0000
0	0	0	1.0000

P5_b =

-3
0
2
1