Assignment 3

se456/cs456: Computer Vision (Section w1), Spr 2018

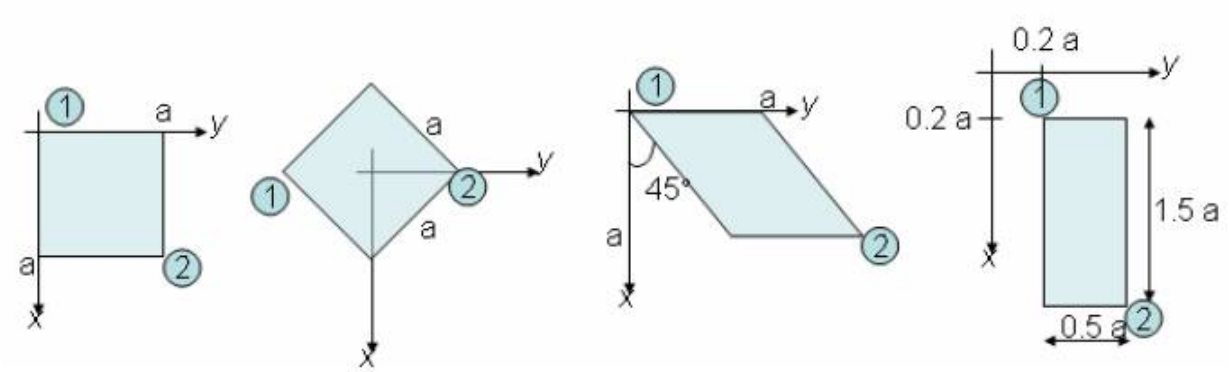
CS/SE, SST, UMT

Student's Name:_____ **Student Id:** _____ **Section:** _____

Total Marks: 100

Note: 5% marks are allocated for posting at least one query on the discussion forum or posting a reply to one query on the discussion forum corresponding to this assignment.

Q1) (15) Consider the shapes shown in the figure. Give affine parameters to transform the first shape into the other three.



Q2) (15) Prove that parallel lines remain parallel after undergoing any 2D affine transformation. Show that this is not the case with projective transformation

Q3) (35=2.5+2.5+10+10+10) Consider the following figure.

a) Write an affine matrix that would perform the rotation on this figure around its center.

b) Write an affine matrix that would perform the scaling of 2 in x and y direction.

c) Write a matlab code (on paper) that applies the transformation matrix of part b to the above figure, and generate a transformed image. (Hint: use the backward transformation. You have to write two nested for loops to apply backward transformation to each pixel. Rather than bilinear interpolations, just take the floor of the coordinates).

d) Repeat part c using Bilinear Interpolation

e) Repeat part d, while ensuring that no part of the transformed image is cropped.

Q4) (20=5+5+5+5) Suppose we have a cube with following 8 points.

Point 1 (x, y, z) = (0, 0, 0)

Point 2 (x, y, z) = (1, 0, 0)

Point 3 (x, y, z) = (0, 1, 0)

Point 4 (x, y, z) = (1, 1, 0)

Point 5 (x, y, z) = (0, 0, 1)

Point 6 (x, y, z) = (1, 0, 1)

Point 7 (x, y, z) = (0, 1, 1)

Point 8 (x, y, z) = (1, 1, 1)

a) Apply shear in x direction w.r.t y (exy =1) and z (exz =1). Make a new diagram

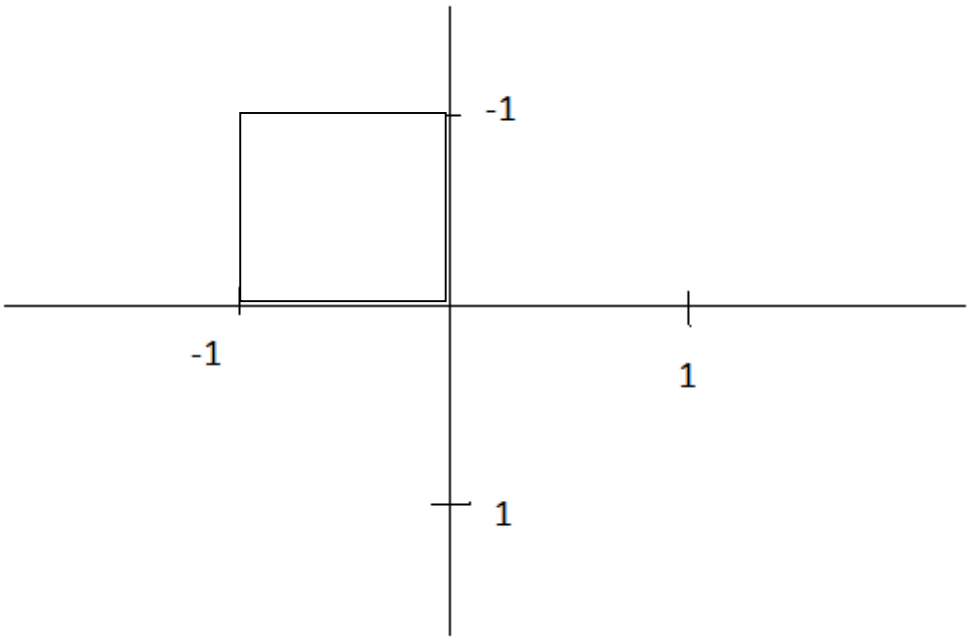
b)Apply shear in y direction w.r.t y (eyx =3) and z (eyz =2). Make a new diagram

c) Apply shear in z direction w.r.t y (ezx =2) and z (ezy =3). Make a new diagram

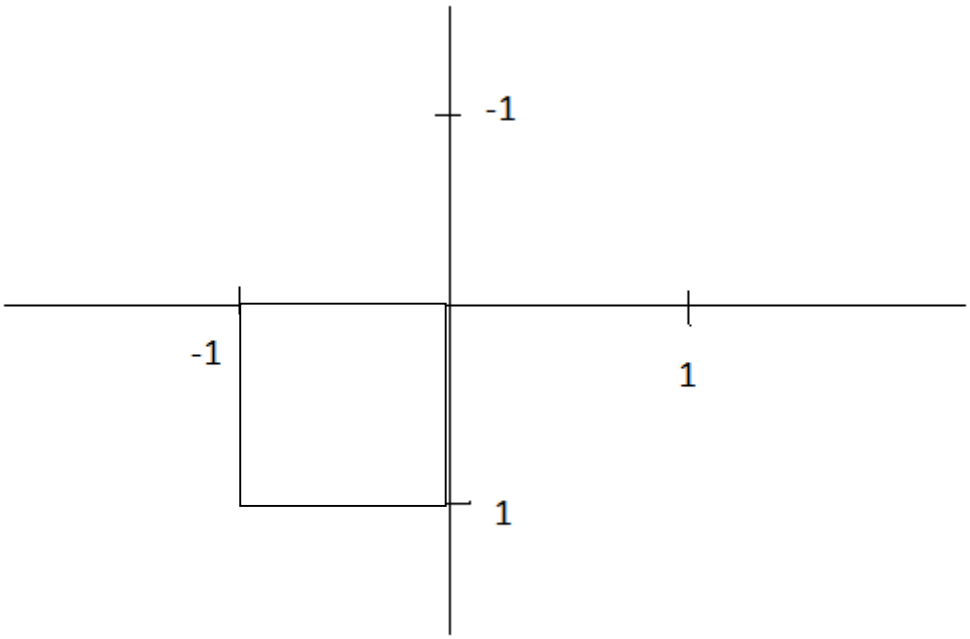
d) Apply shear in x direction w.r.t y (exy =1) and z (exz =1), shear in y direction w.r.t y (eyx =3) and z (eyz =2), shear in z direction w.r.t y (ezx =2)and z (ezy =3). Make a new diagram.

Q5) (15=5+5+5) Rotate the following figure around its center. Show the matrices and also show complete working.

a)



b)



c)