22AIE214 – INTRODUCTION TO ROBOTICS

LABSHEET 2

Name : Anuvind M P

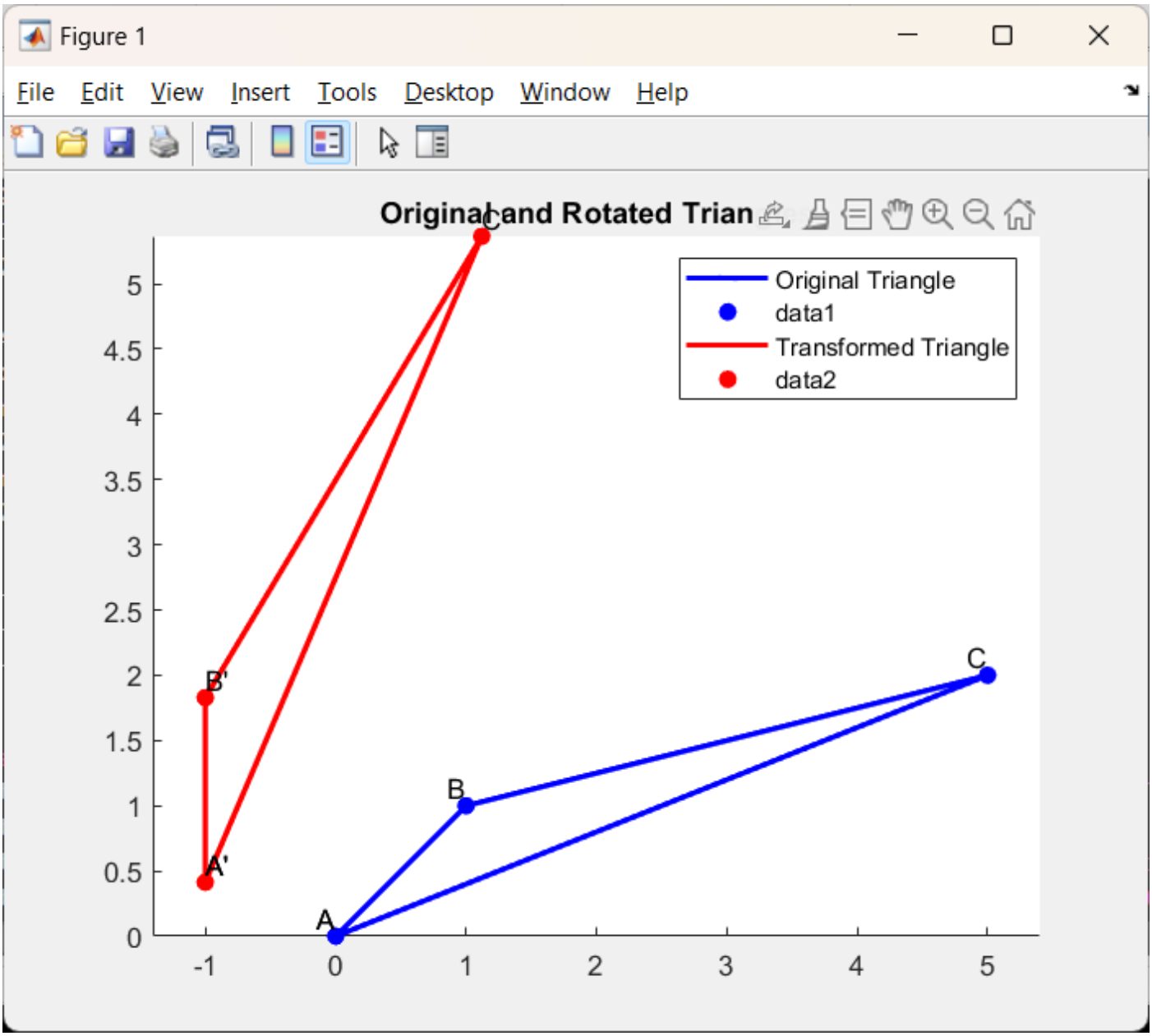
Roll no: AM.EN.U4AIE22010

Q1)Rotate a triangle placed at A(0,0), B(1,1) and C(5,2) by an angle 45 with respect to point P(-1,-1). Plot the points.

CODE:

```
A = [0, 0];
B = [1, 1];
C = [5, 2];
P = [-1, -1];
theta = 45;
theta_rad = deg2rad(theta);
T1 = transl2(-P(1), -P(2));
R = trot2(theta_rad);
T2 = transl2(P(1), P(2));
POSE = T2 * R * T1;
vertices = [A; B; C; A];
vertices_hom = [vertices, ones(size(vertices, 1), 1)];
vertices_transformed_hom = (POSE * vertices_hom')';
vertices_transformed = vertices_transformed_hom(:, 1:2);
figure;
hold on;
axis equal;
plot(vertices(:, 1), vertices(:, 2), 'b-', 'LineWidth', 2, 'DisplayName', 'Original Triangle');
plot(vertices(:, 1), vertices(:, 2), 'bo', 'MarkerFaceColor', 'b');
text(vertices(:, 1), vertices(:, 2), {'A', 'B', 'C', 'A'}, 'VerticalAlignment', 'bottom',
'HorizontalAlignment', 'right');
plot(vertices_transformed(:, 1), vertices_transformed(:, 2), 'r-', 'LineWidth', 2,
'DisplayName', 'Transformed Triangle');
plot(vertices_transformed(:, 1), vertices_transformed(:, 2), 'ro', 'MarkerFaceColor', 'r');
text(vertices_transformed(:, 1), vertices_transformed(:, 2), {'A''', 'B''', 'C''', 'A'''},
'VerticalAlignment', 'bottom', 'HorizontalAlignment', 'left');
title('Original and Rotated Triangles');
legend('show');
hold off;
function T = transl2(x, y)
   T = [1 0 x;
        0 1 y;
        0 0 1];
end
function R = trot2(theta)
   R = [cos(theta) -sin(theta) 0;
        sin(theta) cos(theta) 0;
        0 0 1];
end
```

OUTPUT:



Q2)Rotate a triangle placed at A(0,0), B(1,1) and C(5,2) by an angle 45 with respect to origin. Plot the points.

CODE:

```
A = [0, 0];
B = [1, 1];
C = [5, 2];
theta = 45;
theta_rad = deg2rad(theta);
R = trot2(theta_rad);
vertices = [A; B; C; A];
vertices_hom = [vertices, ones(size(vertices, 1), 1)];
vertices_transformed_hom = (R * vertices_hom')';
vertices_transformed = vertices_transformed_hom(:, 1:2);
figure;
hold on;
axis equal;
```

```
plot(vertices(:, 1), vertices(:, 2), 'b-', 'LineWidth', 2, 'DisplayName', 'Original Triangle');
plot(vertices(:, 1), vertices(:, 2), 'bo', 'MarkerFaceColor', 'b');
text(vertices(:, 1), vertices(:, 2), {'A', 'B', 'C', 'A'}, 'VerticalAlignment', 'bottom',
'HorizontalAlignment', 'right');
plot(vertices_transformed(:, 1), vertices_transformed(:, 2), 'r-', 'LineWidth', 2,
'DisplayName', 'Transformed Triangle');
plot(vertices_transformed(:, 1), vertices_transformed(:, 2), 'ro', 'MarkerFaceColor', 'r');
text(vertices_transformed(:, 1), vertices_transformed(:, 2), {'A''', 'B''', 'C''', 'A'''},
'VerticalAlignment', 'bottom', 'HorizontalAlignment', 'left');
title('Original and Rotated Triangles');
legend('show');
hold off;
function R = trot2(theta)
   R = [cos(theta) -sin(theta) 0;
        sin(theta) cos(theta) 0;
        0 0 1];
end
```

OUTPUT: