Started on	Friday, 12 March 2021, 3:35 PM
State	Finished
Completed on	Friday, 12 March 2021, 4:05 PM
Time taken	29 mins 27 secs
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 4.00 out of 4.00

Consider the following projection.

- Projection Plane is at y = 20 and perpendicular to y-axis (ie. parallel to xz plane).
- COP is at distance 70 from (0, 20, 0). The direction from (0, 20, 0) to COP is given by direction vector (10, -30, 10). The given direction vector is not normalized.
- P1 is the projection of point P(20, 55, 35) in the projection plane.

Write the coordinate values for COP and P1. [All calculation should be done with 3 decimal places (round off)]

a) [1 mark] COP = (21.140 , -43.350 , 21.140)

[No partial marking]

✔

b) [3 marks] x, y and z values of P1:

P1 (x) = 20.406

✔

P1 (y) = 20

✔

P1 (z) = 30.066

✔

Your answer is correct.

Detailed Answer:

Normalized direction vector = (dx, dy, dz)

$dx = round(10/sqrt(10 * 10 + -30 * -30 + 10 * 10), 3) = 0.302;$

$dy = round(-30/sqrt(10 * 10 + -30 * -30 + 10 * 10), 3) = -0.905;$

$dz = round(10/sqrt(10 * 10 + -30 * -30 + 10 * 10), 3) = 0.302;$

$\#COP = (cop_x, cop_y, cop_z)$

$cop_x = round(0 + 70 * 0.302, 3) = 21.14;$

$cop_y = round(20 + 70 * -0.905, 3) = -43.35;$

$cop_z = round(0 + 70 * 0.302, 3) = 21.14;$

compute t

$P1(y) = pp_y = 20;$

$t = round((20 - -43.35)/(55 - -43.35), 3) = 0.644;$

$P1(x) = round(21.14 + 0.644 * (20 - 21.14), 3) = 20.406$;

$P1(z) = round(21.14 + 0.644 * (35 - 21.14), 3) = 30.066$;

Question **2**

Correct

Mark 6.00 out of 6.00

Consider two view volumes as defined below.

View volume-1 (VV-1)	View volume-2 (VV-2)
x = z; x = -z	x = 1; x = -1
y = z; y = -z	y = 1; y = -1
z = -0.4; z = -1	z = 0; z = -1

A line segment PQ is defined in VV-1 with P = (0.6, -0.7, -0.8) and Q = (-0.5, 0.6, -0.7). The first view volume (VV-1) is transformed to the second view volume (VV-2) with the help of transformation matrix M. The line segment PQ becomes P_1Q_1 in VV-2.

Write the transformation matrix M and the coordinate values for P_1 and Q_1.

[All calculation should be done with 3 decimal places (round off)]

a) [4 marks] Matrix M:

$M =$

1	0	0	0
0	1	0	0
0	0	0.714	-0.286
0	0	-1	0

[No partial marking]

✔

Detailed Answer:

$-z_{min} = -0.4$

$z_{min} = 0.4$

Combined Transformation Matrix:

M =

1	0	0	0
0	1	0	0
0	0	$\frac{1}{(1+z_{min})}$	$\frac{-z_{min}}{(1+z_{min})}$
0	0	-1	0

=

1	0	0	0
0	1	0	0
0	0	$round(\frac{1}{(1+0.4)}, 3)$	$round(\frac{-0.4}{(1+0.4)}, 3)$
0	0	-1	0

=

1	0	0	0
0	1	0	0
0	0	0.714	-0.286
0	0	-1	0

Computation for P1 and Q1

[P1 Q1] =

1	0	0	0
0	1	0	0
0	0	0.714	-0.286
0	0	-1	0

*

0.6	-0.5
-0.7	0.6
-0.8	-0.7
1	1

=

0.6	-0.5
-0.7	0.6
-0.857	-0.786
0.8	0.7

=

0.75	-0.714
-0.875	0.857
-1.071	-1.123
1	1

b) [1 mark] P1 = (0.750 , -0.875 , -1.071)

[No partial marking]

✔

c) [1 mark] Q1 = (-0.714 , 0.857 , -1.123)

[No partial marking]

✔

Your answer is correct.

◄ Part-2

Jump to...

Part-4 ►