EE5808 Assignment 2   (Total marks = 100)

Qn 1 (20 marks)

a) What is the key difference between perspective and parallel projection?   (5 marks)

b) What is the key difference between cavalier and cabinet projection?   (5 marks)

c) Given the following OpenGL command:

   glOrtho(-2, 2, -2, 2, -2, 2);

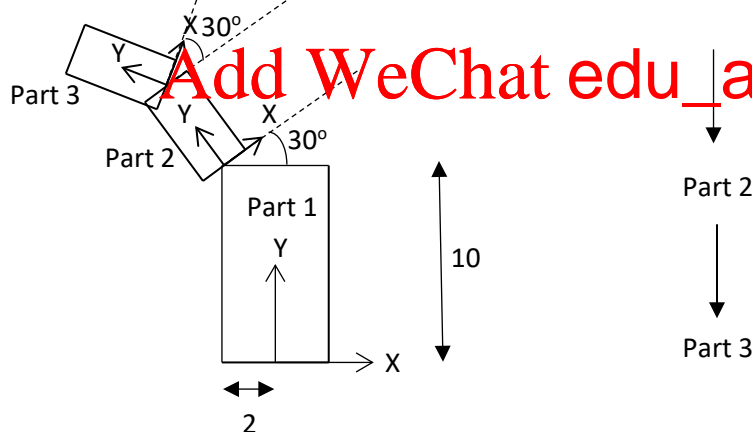   What is the equation of the view plane? What coordinates is the equation expressed in?
                                                                                          (5 marks)

d) A camera is positioned at $(100, 100, 100)$. It is pointing at $(0, 100, 0)$. The view up vector is $(0, 0, 1)$. Write an OpenGL command that defines the camera.   (5 marks)

Qn 2 (30 marks)

The figure below sho   G. Z is pointing out of
the paper. There is n

Part 1 is a cylinder with radius 2 and height 10. It has been implemented in a function *Part ( )*.
Part 2 is Part 1 scaled down by 0.5 in the X and Y direction with no scaling in the Z direction.
Part 2 is also rotated (30^0) and translated as shown. Part 3 is rotated (30^0) and translated with
respect to Part 2 as shown.

   a) Derive the 4 x 4 homogeneous transformation $M_{2\leftarrow 3}$.
                                                                                          (5 marks)

b) Derive the 4 x 4 homogeneous transformation $M_{1 \leftarrow 2}$.

(5 marks)

c) Hence write an OpenGL program for the hierarchical object.

(10 marks)

d) If the object is to have the following motion:

- Part 3 rotated about its Y axis by 45°
- Part 1 translated along its X axis by 10 unit

Add code to your program to realize the motion. Underline the added code.

(10 marks)

Qn 3 (50 marks)

a) Given the following OpenGL command

gluLookAt (0, 100, -100, 0, 0, 0, 0, 1, 0);

Derive the 4 × 4 homogeneous transformation $M_{VC \leftarrow WC}$. Evaluate the inverse.

(15 marks)

b) The projection ve ... let the view plane be
$Z = -5$. Derive ... atrix should record the
original Z value before projection.

(10 marks)

c) In the following figure, Y axis is pointing out of ( ) and Part_2 ( )
have been written. Part 3 is Part 2 reflected about the Z axis of Part 1.

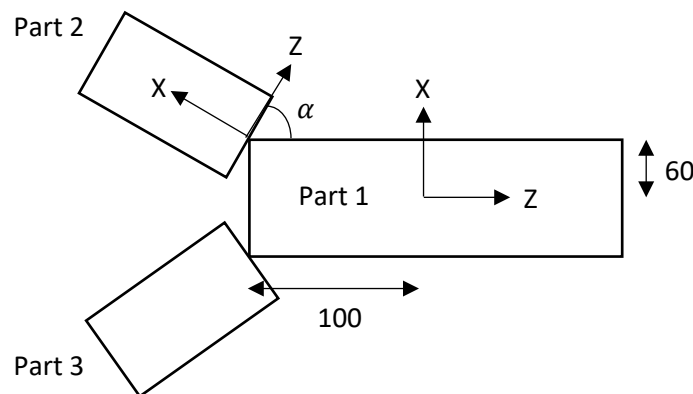
Fig. 2

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Angle $\alpha = 30^o$

    i)   Derive the 4 x 4 homogeneous transformation $M_{P1 \leftarrow P2}$.   (5 marks)

    ii) Write an OpenGL function object ( ) for the object.   (10 marks)

iii) Suppose

    -   Part 2 rotates about its own axis X by 15°. Note that Part 3 should rotate symmetrically.
    -   The whole object translates by (10, 10, 10).

     Add code to your function for the motion. Underline your code.   (10 marks)

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