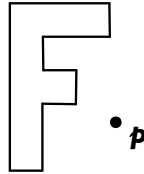


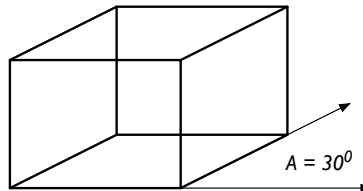
6. (a) The F-shaped object shown below is to be doubled in size and rotated about point \mathbf{p} by 60° . Give the homogeneous transformations which are performed on the vertices of the object and the final concatenated matrix.

$$\mathbf{F} = \{ \mathbf{f}_0, \mathbf{f}_1, \dots, \mathbf{f}_9 \}$$



[6]

- (b) A View Volume is specified by the bottom-left hand corner of the Near plane, at (L, B) and the top-right hand corner of the Far clipping plane, at (R, T). If the clipping planes are at distances N and F from the viewpoint, derive the Orthographic Projection Matrix. [12]
- (c) An Oblique Projection is required that displays all lines parallel to the z-axis drawn at an angle $A = 30^\circ$ to the horizontal on the view plane, as shown below.



Work out a transformation matrix that can be concatenated with your answer to (b), to perform this type of projection. [7]