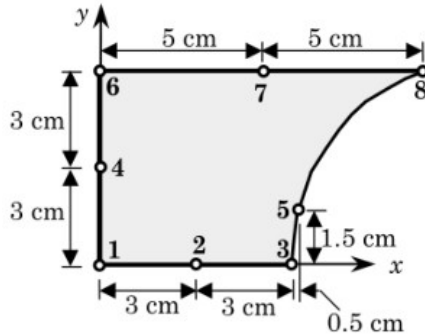
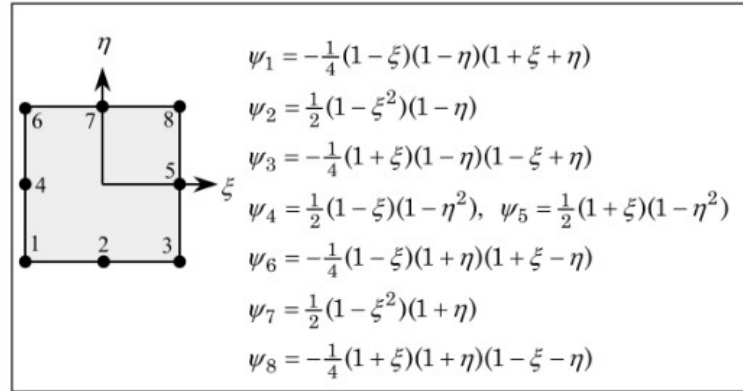


Q.4. For quadratic quadrilateral element shown in Figure 4a, the corresponding master element and the respective shape functions are shown in Figure 4b.

- What are the geometry transformations equations for the coordinates  $x$  and  $y$ . **[4 marks]**
- What is the Jacobian matrix for the transformation from the global to natural coordinate system **[2 marks]**



(a)



(b)

Figure 4

\*\*\*\*\*