1. Determine the critical crack length, from which the crack will start to propagate and lead to the fracture of the specimen, if $K_{IC} = 30 \text{ MPa.m}^{1/2}$ and the stress is 15 MPa.

\[ K_i = \beta \sigma \sqrt{\pi a} \quad \text{where} \quad \beta = 1.12 \text{ for edge cracks and } \beta = 1.0 \text{ for center cracks}. \]

If $K_i = K_{IC}$ crack will start to propagate. Hence

\[ K_i = K_{IC} = 30 \text{ MPa}\sqrt{m} = \beta \sigma \sqrt{\pi a} = 1.12 \times 15 \times \sqrt{\pi a} \]

Therefore, the critical crack length is:

\[ a = \frac{1}{\pi} \left( \frac{30}{1.12 \times 15} \right)^2 \approx 1.015 \text{ m} \]