

Explain Von – Mises' criterion of plane stress estimating the plastic zone size around the tip of a mode – I crack.

(b) Explain the critical condition of a crack growth.

6. (a) What is Ramberg – Osgood's relation for the strain under the condition of plastic flow ?

Utilizing the above relation, estimate the total J – Integral for a rectangular path contour, Γ as the near – field contour in a single – edge notched specimen subjected to far – field stress, σ .

(c) Calculate the energy density, W and total J – Integral for the contour a – b – c – d – a in an Al – alloy plate as shown in Fig. 1. Use the following data:

Crack size, $a_0 = 1.5$ mm, $w = 21$ mm, $\sigma_{ys} = 65$ MPa, $E = 80,000$ MPa, $\alpha = 0.35$, $n = 5$, $P = 1.5$ kN, $y_{23} = w / 3$ and $B = 1.0$ mm.

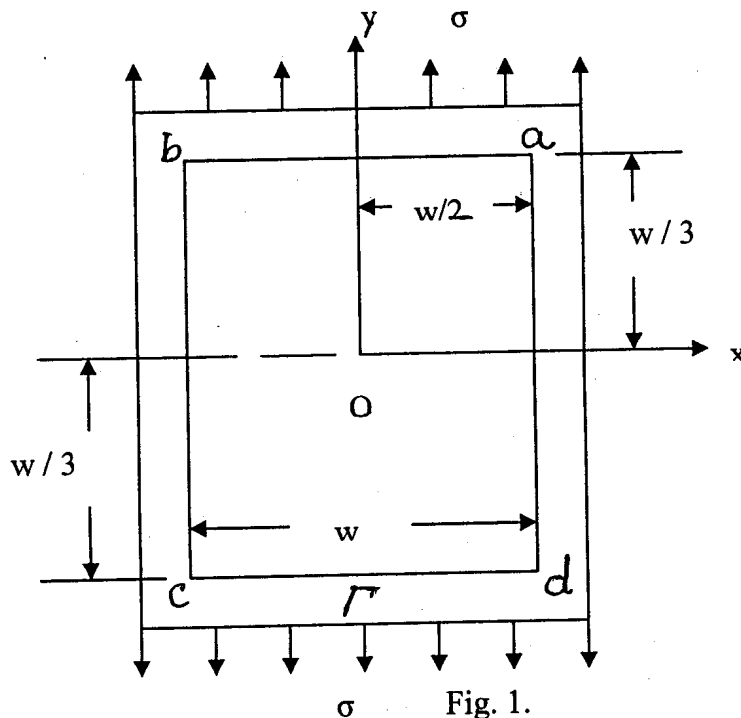


Fig. 1.

7. Explain the following concepts:

- (i) Stress intensity factor
- (ii) J – Integral
- (iii) Dugdale's approach for estimating the plastic zone size around the crack tip