Engineering Fracture Mechanics

Assignment # 2

Energy Release Rate, Compliance Approach

1. Inglis solution for an elliptical hole has brought out the severity of a crack. Are all cracks dangerous? Defend your answer based on Griffith's analysis.

2. (a) Indicate graphically the energy availability for crack growth under constant load and constant displacement.

   (b) Establish a relationship between potential energy and energy release rate.

3. Determine the energy release rate for the specimen shown in Fig.1 (Hint: Calculate the strain energy by strength of materials analysis).

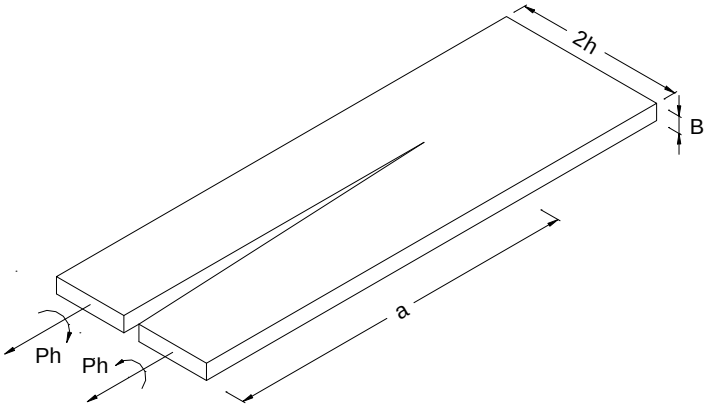

Fig. 1

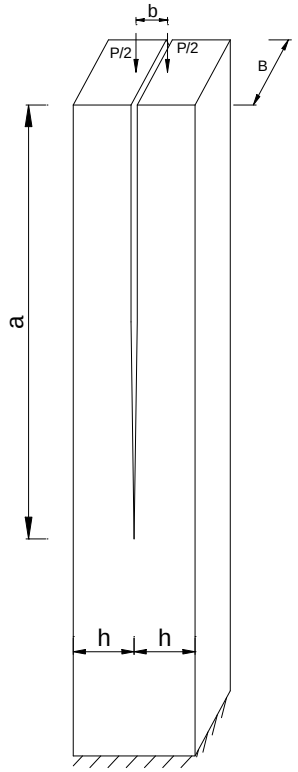

Fig. 2

4. A rectangular elastic strut has a thickness B and a slit of length *a* starting from the top (Fig. 2). Assuming h<<*a*, use the Compliance method to evaluate the energy release rate. Also calculate the stress intensity factor.

5. Derive analytically the expression relating Energy Release Rate and Stress Intensity Factor for a plane stress case under Mode-I Loading.

6. What are the necessary and sufficient conditions for the onset of fracture?

7. Why does a crack branch? Provide a simplistic explanation with the help of an appropriate graph.

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