Fracture Mechanics ME 6104 **National University of Singapore**

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Assignment # 6

Problem 1

The stress intensity factor for a prevailing crack in a structure is given by $K_I = \beta\sigma\sqrt{\pi a}$. The crack length was found to be a=0.1" and β in this case equals 3. What is the highest permissible stress if stress corrosion cracking is to be prevented? The structure's material has a $K_{Iscc} = 15 ksi\sqrt{in}$.

Problem 2

A material with $K_{Ic} = 30 ksi\sqrt{in}$ is subjected to stress corrosion tests in salt water. Three specimens with a single edge crack are loaded in uniform tension at loads of 18,24, and 30 kips respectively.

Specimen data

crack length a=0.5"

specimen width W=3"

specimen thickness B=0.5".

material yield stress $\sigma_{yp} = 70 ksi$

The time to failure of the three specimens: 5000, 100, and 3 hours respectively. Estimate K_{Iscc} and calculate the amount of crack growth that occurred in each of the tests. Assume $\beta=1.12$ throughout.