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Name:

Homework 4

Due 25 Feb 2016

1. Use the MIL-HDBK pages copied in your text (pp. 136-143) to look up the following yield stress values. Use the A-basis for all values.
   (a) 2024-T351 bare, t=0.25, LT direction
   (b) 2024-T351 bare, t=0.25, L direction
   (c) 7075-T651 bare, t=0.5, LT direction
   (d) 7075-T651 bare, t=0.5, L direction
   (e) 7178-T651 bare, t=0.4, LT direction
   (f) 7178-T651 bare, t=0.4, L direction

2. Use the charts provided in your text (pp. 111-121) to look up fracture toughness for the following conditions, at both room temperature and -65°F.
   (a) 2024-T351 bare, t=0.25, T-L direction
   (b) 2024-T351 bare, t=0.25, L-T direction
   (c) 7075-T651 bare, t=0.5, T-L direction
   (d) 7075-T651 bare, t=0.5, L-T direction
   (e) 7178-T651 bare, t=0.4, T-L direction
   (f) 7178-T651 bare, t=0.4, L-T direction

3. Use the Fedderson approach to plot residual strength vs. crack length for a center-cracked panel ($W = 5$ in.)
   (a) For 2024-T351 bare aluminum, with t=0.25, in the T-L and L-T directions, at room temperature and -65°F.
   (b) For 7075-T651 bare aluminum, with t=0.5, in the T-L and L-T directions, at room temperature and -65°F.
   (c) For 7178-T651 bare aluminum, with t=0.4, in the T-L and L-T directions, at room temperature and -65°F.

4. Based on a proposed inspection cycle and fatigue analysis for a 7178-T651 bare aluminum panel, we need to design a proof test to ensure there are no center-cracks greater than 0.2" long. What proof load must be applied to ensure this condition ($W = 8$ in., $t = 0.4$ in., check both grain directions, RT and -65°F).

5. A 120" diameter fuselage has an axial crack. The crack is centered on a circumferential stiffener. Stiffener spacing is 10", cross-section is 0.3788 in^2, skin thickness is 0.1875", and rivet spacing is 1". Use the charts on pp. 167-178 and the tables on pp. 194 - 196 to plot the σ_c vs. a curve for the skin under the following cases. Note: use $K_c = 68$ ksi$\sqrt{\text{in}}$. Assume a skin stiffness of $E = 11$ Msi and a stiffener stiffness of $E_s = 23.4$ Msi and a stiffener yield strength of $\sigma_{YS} = 120$ksi.

   (a) without stiffeners

   (b) with stiffeners

   (c) with stiffeners, but the stiffener centered over the crack is broken

   Note: Ignore net section yield for the skin in this problem