Indian Institute of Science
ME 242: Midsemester Test

Date: 2/11/11.
Duration: 10.00 a.m.–11.00 a.m.
Maximum Marks: 10

1. A thin circular disc of inner and outer radii a and b, is subjected to pressure p on its outer edge $r = b$, and is bonded to a rigid inclusion at its inner edge $r = a$ as shown in Fig. 1. Assuming the displacements and stresses to be given by

$$u_r = \frac{1}{E}\left[-(1+\nu)\frac{A}{r} + 2(1-\nu)Br\log r - B(1+\nu)r + 2C(1-\nu)r\right] + H\sin\theta + K\cos\theta,$$

$$u_\theta = \frac{4}{E}Br\theta + Fr + H\cos\theta - K\sin\theta,$$

$$\tau_{rr} = \frac{A}{r^2} + B(1 + 2\log r) + 2C,$$

$$\tau_{\theta\theta} = -\frac{A}{r^2} + B(3 + 2\log r) + 2C,$$

$$\tau_{r\theta} = 0,$$

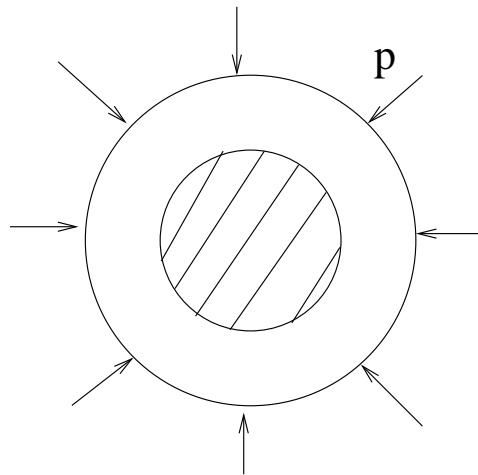find the constants A, B, C, F, H and K.

Figure 1: Thin circular disc subjected to pressure on the outer surface, and bonded to a rigid inclusion at its inner surface.