

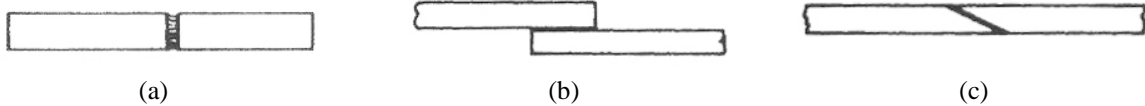
# Assignment #7

Material and Manufacturing Processes (M2794.001800) Fall 2014, Prof. Ahn, Sung-Hoon  
 Out: December 2, 2014 / Due: 12PM, December 8, 2014 (Bldg. 301, Room 1405)

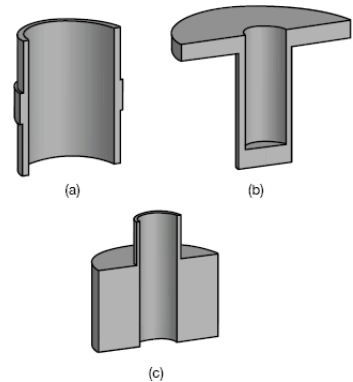
1. If a fully dense ceramic has the properties of  $UTS_0 = 150 \text{ MPa}$ ,  $E_0 = 300 \text{ GPa}$ , and  $k_0 = 0.8 \text{ W/m} \cdot \text{K}$ , what are these properties at 20 % porosity? Let  $n = 5$  and  $P = 0.15$ .

2. A gear is to be manufactured from iron powder. It is desired that it have a final density that is 90 % of that of cast iron, and it is known that the shrinkage in sintering will be approximately 5 %. For a gear 6.35 cm in diameter and a 1.905-cm hub, what is the required press force?

3. Briefly describe each joint - name, advantages and disadvantages in load-carrying performance.



4. The axisymmetric parts shown in the accompanying figure are to be produced through P/M. Describe the design changes that you would recommend.



5. The figures below represent (a) adhesive joint and (b) riveted joint respectively. Assuming that the tensile load provokes failures at the circled areas in the figures, explain why the joints in (a) and (b) fail in those areas respectively. Also suggest alternative designs for (a) and (b) to prevent those failures.

