**Design Problem #1**

MEC 201, Fall 2011 semester, **due 10/27**

**Problem Statement:**

In this design problem, you will design the base of a halogen desk lamp. The desk lamp is shown in Figure 1. All of the dimensions shown in Figure 1 are given to you except for $r$ and $d$, which you must determine, along with the weight of the base $W$. You must select values of $r$, $d$, and $W$ so that the desk lamp will not tip over if it is put in any position that is possible given the range of motion specified in Figure 1. The range of motion of the lamp arms is $60° \le \alpha \le 120°$, $30° \le \beta \le 60°$, and $-60° \le \gamma \le 60°$, where the angles $\alpha$ and $\beta$ are measured from horizontal regardless of the position of the arms. The weight of the halogen bulb and housing assembly is 1 lb, and it has its center of mass at $D$. For this design problem, you can ignore the weight of the arms $AB$ and $BC$.
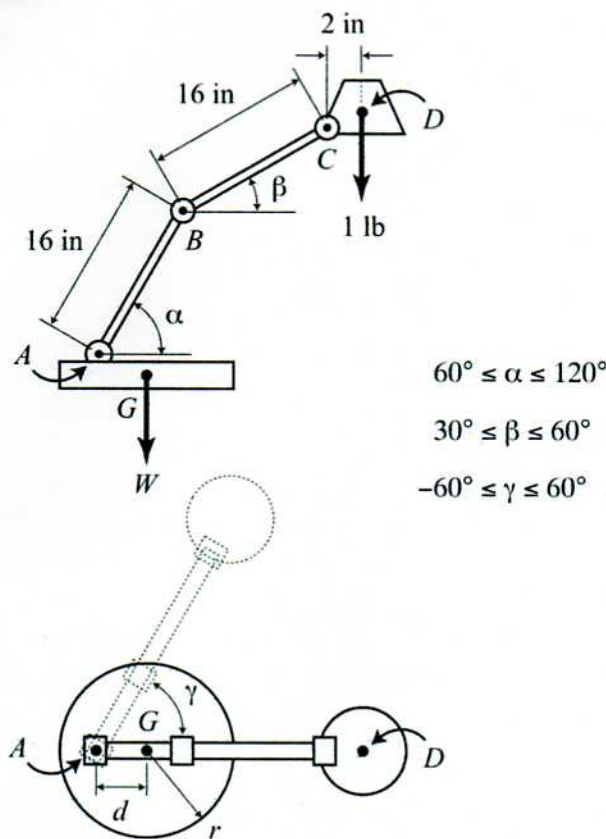


$$60° \le \alpha \le 120°$$

$$30° \le \beta \le 60°$$

$$-60° \le \gamma \le 60°$$

**Figure 1**: The halogen desk lamp for which you must design a circular base. You must specify the dimensions $r$ and $d$ and the weight of the base $W$ so that the desk lamp will not tip over in any position.

1