

Indian Institute of Technology Delhi

Department of Physics

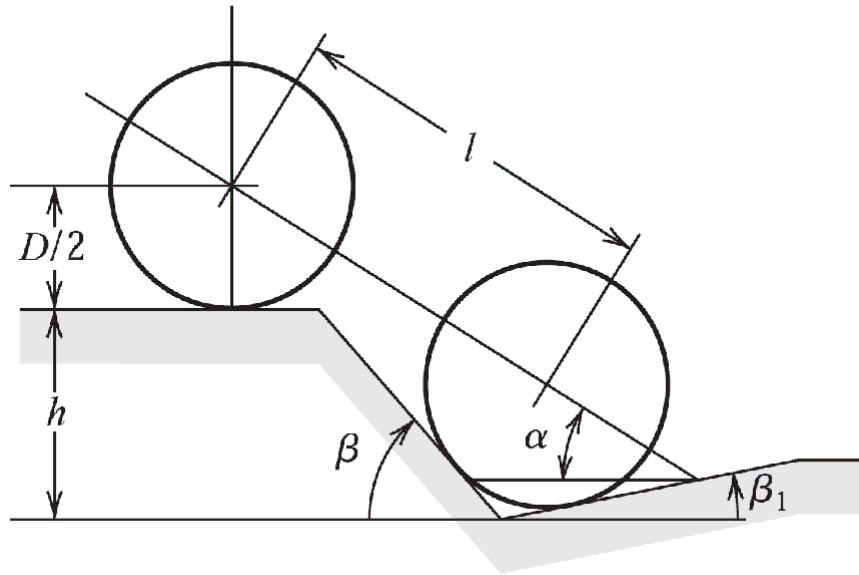
PYL800 Numerical Methods

Assignment I

1. In the design of all-terrain vehicles, it is necessary to consider the failure of the vehicle when attempting to negotiate two types of obstacles. One type of failure is called hang-up failure and occurs when the vehicle attempts to cross an obstacle that causes the bottom of the vehicle to touch the ground. The other type of failure is called nose-in failure and occurs when the vehicle descends into a ditch and its nose touches the ground. The accompanying figure, shows the components associated with the nose in failure of a vehicle. In that reference it is shown that the maximum angle α that can be negotiated by a vehicle when β is the maximum angle at which hang-up failure does not occur satisfies the equation

$$A \sin \alpha \cos \alpha + B \sin^2 \alpha - C \cos \alpha - E \sin \alpha = 0$$

where $A = l \sin \beta_1$, $B = l \cos \beta_1$, $C = (h+0.5D) \sin \beta_1 - 0.5D \tan \beta_1$ and $E = (h+0.5D) \cos \beta_1 - 0.5D$. If $l = 89 \text{ in.}$, $h = 49 \text{ in.}$ and $\beta_1 = 11.5^\circ$ plot α for the situation when D changes from 30 – 100 inches (at least five values required in the plot).



Instructions

Program with comments. A pdf with your results, graph (This shows how good you fit is) and commands for compiling your program.