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Reconstruction of a Slippery Undulated bottom Substrate for a thin film flow over it with a Prescribed Spatially Periodic Free Surface USHA RANGANATHAN, Professor, Department of Mathematics, Indian Institute of Technology Madras — A gravity-driven film flow on a slippery undulated inclined substrate is considered. The inverse problem of finding the topography of the bottom slippery substrate for a specific free surface shape which is evolved for flow over it is investigated. Applying the Energy Integral Method, evolution equations for the flow rate and the film thickness are obtained. The influence of slip coefficient, film thickness, inertia and surface tension on the shape of the slippery substrate is examined by prescribing the free surface of the flow over it as a mono frequent periodic function. The contour of the slippery undulated bottom substrate is obtained analytically for weakly undulated free surface. The results of the numerical simulations reveal that the slippery bottom substrate may become strongly nonlinear. The linear stability of the corresponding direct problem is examined and the critical Reynolds number for the flow with a fixed undulated free surface is found to be strongly influenced by surface tension.

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