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Power law and log law velocity distributions in the wall bounded turbulent flows on transitional rough walls: New approach to universal scaling NOOR AFZAL, Aligarh Muslim Univ. — An alternate two layers theory, based on four new scalings for transitional wall roughness variables, is presented for large appropriate roughness Reynolds numbers. For velocity profile the matching of inner and outer layers in the overlap region, by Izakson-Millikan-Kolmogorov hypothesis (Afzal, N. 2005 Proc. Royal Society A: PME 461, 1889-1910) leads to functional solutions that are universal log laws, as well as universal power laws, that explicitly independent of transitional wall roughness, having same constants as in smooth wall case. The universal log or power laws velocity profile and skin friction, if expressed in terms of traditional Reynolds numbers also yield log law and power laws that depend on surface roughness. The skin friction, in traditional variables, is predicted by a single relation for inflectional type of Nikuradse roughness for sand grain type roughness data and Colebrook commercial monotonic roughness. The extensive experimental data for various types of wall transitional roughness provide very good support to present theory of universal log laws as well as new predictions in traditional log laws . The experimental data from various sources (Osaka and Mochizuki, Kameda et al, Antonia and Krogstad, Smalley et al, Schultz and Flack and Leonardi et al for boundary layers and Nikuradse, Shockling and Bakken for pipes/Channels) provide strong support to the new scaling for log and power laws. Moody type diagram for inflectional roughness for boundary layer and pipe flows are presented.

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