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Two-dimensional Potential Flow past a Cylinder of Arbitrary Sectional Form

By Hikoji YAMADA

The problem of the subject is treated in all its generalities, and reduced to the determination of the correspondence between the contour line element ds and that of the unit circle $d\sigma$, the correspondence being a result of the conformal mapping of the flow domain onto the outside region of a unit circle. The determination can be accomplished by successive approximation, as usual in such a problem, but with less labors in some cases. The treatment of angular points and inverse problems are also described in detail.

On the Solutions of First-order Ordinary Differential Equations with Periodic Properties

By Michio OHJI

On the differential equation of the form

$$\dot{x} \equiv dx/dt = f(t, x),$$

where $f(t, x)$ is a periodic function of t, the asymptotic nature of its solution for $t \to \infty$ is considered in a topological way.

The primary result is that if $f(t, x)$ is monotonous in x, some predictions are possible concerning the existence, uniqueness and stability of periodic solutions.

The method is applied to four examples. Two of them are the basic equations of a tidal lake which have previously been studied by Research Committee for Hydrology (1953), and the present theory confirms some of their conclusions on the periodicity of solutions.

Studies on the Characteristics of Breakers and Wave Run-up on Smooth and Artificially Roughened Slopes

By Kinji SHINOHARA

The depth of the experimental wave tank is 20, 25, 30, 35, 40 cm, in which smooth and artificially roughened slopes sticked with sand grains of mean dia. 0.82 mm are placed. The wave steepness of deep water is 0.001～0.09. The auther concludes the result of the experiment which was investigated about the characteristics of breakers and the relations between their characteristics and wave rum-up under these conditions as follows:

About the height of breaker H_b

1. The relation between H_b/H_0 and δ_0 has nothing to do with the difference of the depth of wave tank.

2. The difference of surface roughness used in this experiment has no influence upon the height of breaker.

3. H_b/H_0 becomes large as δ_0 becomes small, and becomes small as the beach slope becomes mild for the same value of δ_0.

4. The values of H_b/H_0 are generally smaller than those from "Breakers and Surf" and Mr. Iversen's experiment for the same values of δ_0. The values obtained from these curves are considered to correspond to the maximum value of H_b/H_0 in the Author's experiments for the same values of δ_0.

About the breaking depth h_b

1. The relation between h_b and δ_0 can be well expressed when non dimensional parameter $s_b = h_b/L_b$ is used.

2. The relation between s_b and δ_0 has nothing to do with the difference of water depth and the roughness of slopes. And s_b becomes large as δ_0 becomes large, but this relation is somewhat different by the beach slopes.

3. In the case of large δ_0, s_b is larger than that from Larras' and the fifth approximation of Dr. Hamada for the same values of δ_0.

4. The relation between h_b/H_b, or h_b/H_0 and δ_0 cannot be well expressed in this experiment. But it seems that the curves given by "Breakers and Surf" or Mr. Iversen give the minimum value of h_b/H_b or h_b/H_0 of this experiment.

About the wave run-up R

1. The relation between R and δ_0 can be expressed better by means of R/H_0 than by R. This relation can be also expressed by using the parameter R/H_b, but the dispersion of the plotted points is fairly large.

2. The values of R vary according to the beach slopes and R/H_0 becomes nearly twice much more in the beach slope 1:10 than in the beach slope 1:20.

3. The difference of surface roughness used in this experiment has no appreciable influence upon the wave run-up, but the values of R are somewhat smaller in the rough surface than those in the smooth surface in the beach slope 1:20.

4. The results of this experiment almost agree with those of Mr. Saville, but R/H_0 is generally small compared with that of Mr. Saville for the same values of δ_0 and especially it is smaller than approximately 30% when δ_0 is less than 0.01.