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Experimental Investigation Of Interaction Between Surface Shallow Water Waves and Floating plates

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Key Words:*Water wave, MMEE, Limited floating plate, Transmission coefficient*

Introduction

The present study has developed a experimental model for the analysis of interaction between surface shallow water waves and floating plates .The fluid is considered homogenous, non-adhesive and non-compressive. Using a restricted floating plate as a large floating structure on the water, which was connected to the bottom of the flume via cables, the floating structure's movements and the level fluctuations of free waters was measured in various draught depths using, respectively, acoustic and impedance sensors. The results indicated that the structure's movements maintain a positive correlation with wave length and height and a negative correlation with draught depth. In the next stage the fluctuations of the free waters surface were investigated using impedance sensors both in the front and at the back of the floating plate and using the results the experimental transmission coefficient was calculated. The results show that an increase in the wave length and period results in an increase in the transmission coefficient. In addition the transmission coefficient was calculated using the method of matched eigenfunction expansions (MMEE) method, which was reasonably consistent the lab results.

Floating Structures

In the past two decades, there have been numerous solutions suggested for dealing with water wave and elastic plate interaction, most of which can be found in articles [1 - 3]. Evidently MMEE method is commonly used in the analysis of the engineering problems. This method originates from the method of the separation of variables, which contains the identification of expansion coefficients as its main stage. [4 & 5] used this method to investigate the surface waveinteraction of an area covered with ice and calculated the expansion coefficients using error function method, which includes three Lagrange multiplier coefficients.

The Initial HypothesisUsed in the Analysis ofFloating Structures

There are theories in the Hydroelastic analysis of Pantoon-Type Very Large Floating Structures (VLFs) [6]. The floating structure as a thin elastic plate with free edges. The fluid is non-compressive, non-viscous and has irrotational motion which in this case, velocity