INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Study of Scattering and Trapping of Water Waves in Two-layer Fluids for Various Types of Structure Configurations and Sea-beds

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SHORT ABSTRACT

The main objective of this thesis is to investigate the wave reflection and transmission, forces, wave run-up, and hydrodynamic coefficients due to the presence of two-dimensional and one-dimensional porous structures in water of various bottom profiles in a two-layer fluid within the framework of linear water wave theory. In our first work, we consider wave interaction with a porous structure over a step-type rigid bottom. We consider two cases: (i) a single-chamber porous structure, (ii) a two-chamber structure with different porosity and friction. In continuation, we consider a caisson type two-block structure over a porous bottom in our second work. This case investigates scattering phenomenon as well as trapping. Further, a perforated wall is considered in front of the structure as a particular case. Next, we attempt a scattering problem in an ocean due to a caisson type two-chamber and multi-chamber structures with a perforated front wall over an elastic bottom in our third and fourth works. The subsequent study explores the problem related to the scattering of linear waves with a composite structure consisting of multiple chambers over the elastic bottom. We mainly focus on scattering coefficients and hydrodynamic coefficients such as waveload, elevation, etc. In our fifth work, we begin by considering a thin poro-elastic barrier over the porous bottom in front of a partially reflecting sea wall. We adopt the least square technique for calculating the unknown coefficients. Consequently, we consider a porous wavemaker over a porous bottom in the sixth work. We analyse the scattering as well as radiation due to the motion(oscillation) of the porous wavemaker. Least square technique is used to find reflection, transmission coefficients and added mass, damping coefficient. In the seventh work, the impact of water wave on a moored floating elastic plate is analyzed in the presence of a thick porous structure as a breakwater. In all cases, the results are validated by comparing with available results as far as possible, and these point towards the effectiveness of the present model for each case in investigating such ocean engineering problems.