

Coastal and Ocean Wave Hydrodynamics  
K.N.T. University of Technology  
Assignment 2

2-1.

A wave of period 8 s, height  $H=1$  m, is recorded by a bottom pressure type wave gage in 20 m depth in water. Assume the wave to be sinusoidal and that the linear wave theory applies.

- (1) What is the length of this wave?
- (2) What is the wave celerity of this wave?
- (3) What is the pressure variation measured by the pressure gage?

2-2.

Given the two velocity potentials

$$\phi_1 = ac \frac{\cosh k(h+z)}{\sinh kh} \sin k(x-ct)$$

$$\phi_2 = -ac \frac{\cosh k(h+z)}{\sinh kh} \sin k(x+ct)$$

Assume linear wave theory to be valid.

- (1) Describe physical meaning what  $\phi_1$  and  $\phi_2$  represent.
- (2) Define a velocity potential

$$\phi = \phi_1 + \phi_2$$

and show that  $\frac{\partial \phi}{\partial x} = 0$  at  $x=0$ . Would the motion described by  $\phi$  be changed if a vertical impermeable wall was introduced at  $x=0$  ?

- (3) Assuming the linear theory to be valid, determine the surface profile corresponding to  $\phi$  and sketch it in the interval  $-L \geq x \geq 0$  at times corresponding to

$$\sigma t = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}.$$

2-3.

A wave maker generates two groups of waves. The first group has a wave period of 1 s, the second group has a period of 1.5 s. The water depth in the flume is 1.5 m. After generation of the 1 s waves, the generator is stopped for 20 s before the 1.5 s waves are generated.

How far down the flume will the front of the 1.5 s waves catch up with the 1 s waves?