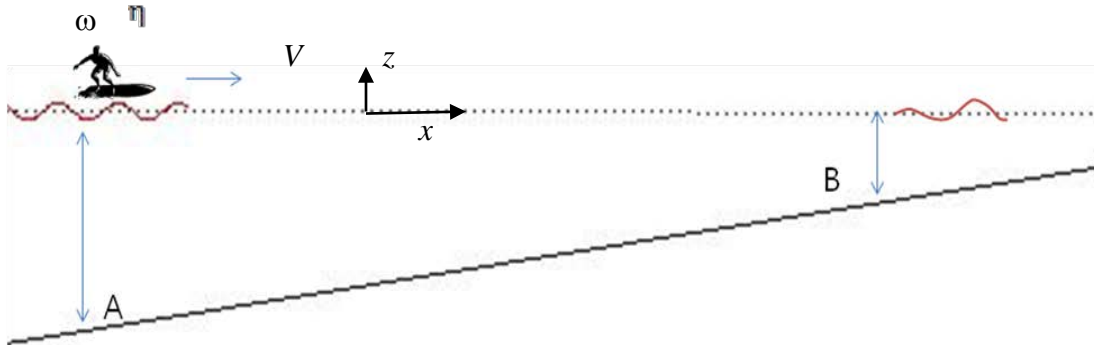


# Quiz #1

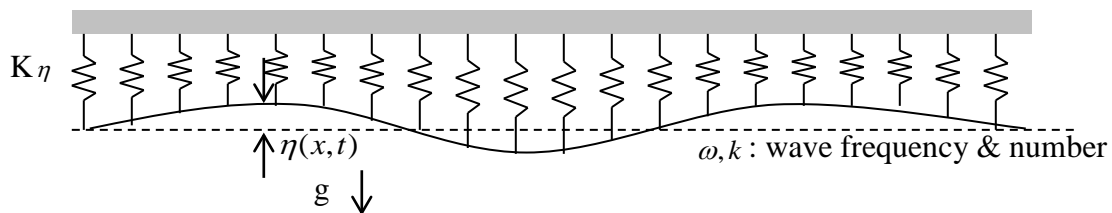
Oct. 17, 2013

2:00~3:30

1. (28%) A young surfer is on a wave crest moving from left to right. It is found that the wave period is 5 sec and wave amplitude is 2 m at section A where water depth is 20 m.



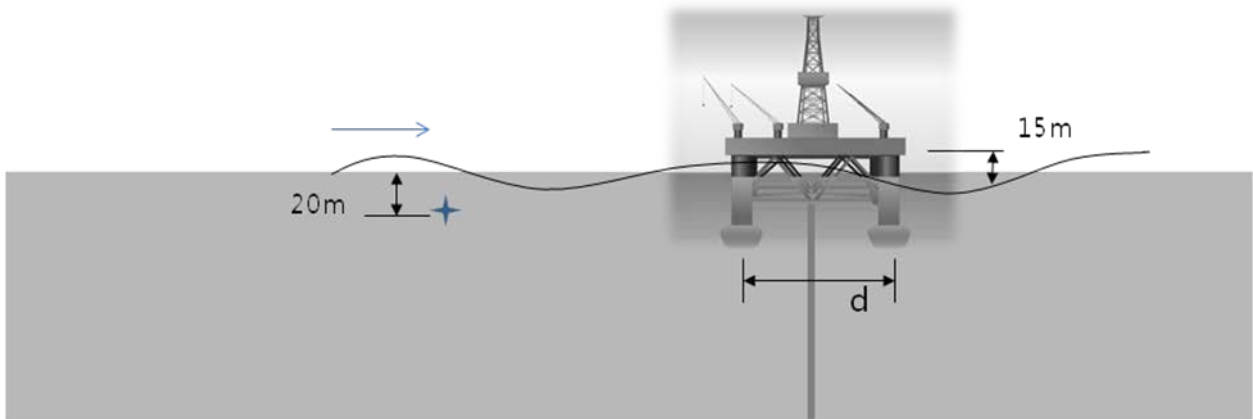
- (1) (7%) What is the speed of this surfer if he moves with wave crest?
  - (2) (7%) In section B where water depth is 5 m, what is the speed of this surfer? Ignore the friction of fluid motion from the sea bottom.
  - (3) (7%) What is the magnitude of dynamic pressure at the sea floor of section A?
  - (4) (7%) Briefly sketch the particle motion along section A and section B.
2. (40%) Let's consider a series of springs attached to a flat ceiling. Since the distance between springs is so close, we can assume that the springs are continuous. A weightless mat is attached to the springs, and the mat is moving with the free surface. If the spring constant is  $K$ , assuming linear free surface flow, answer the following questions:



- (1) (15%) Derive linear free surface boundary condition.
- (2) (15%) Derive a dispersion relation.
- (3) (10%) If the wave frequency is the same, compare wavelengths and phase velocities when  $K=0$  and  $K>0$ .

3. (32%) Consider a semi-submersible platform in ocean waves. To observe the ocean waves, you installed a velocity and pressure sensors at 20m depth, and once you measured a regular oscillatory signal of horizontal velocity with the period of 12.5 sec and amplitude 3 m/sec. Assuming linear waves in deep water and body is not moving, answer the following questions

- (1) (8%) How much is wave length?
- (2) (8%) What is the amplitude of ocean wave? If the freeboard of the deck platform is 15m, do the waves hit the deck of this platform?
- (3) (8%) What is the amplitude of vertical velocity which the sensor measures?
- (4) (8%) If you determine the distance of column legs to consider the condition as shown in the below figure, what distance will you choose? What can be the shortest distance?



**Good Luck!!**