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87.202 - PRINCIPLES OF EARTH & ENVIRONMENTAL SYSTEMS II
STUDY QUESTIONS AND PROBLEMS XII

1. Draw an ideal wave and label the parts.

2. Diagrammatically show the changes in the orbits of water particles at various depths below the water surface for both deep-water and shallow-water waves. Explain the differences between the two types of waves.

3. Explain the difference between capillary and gravity waves.

4. Define sea and swell. Describe how each forms.

5. What factors limit the maximum size of wind waves in the ocean?

6. What are seismic sea waves (tsunamis)? How and where are they formed? What areas are most likely to experience tsunamis?

7. The length of a wave in water of 50 m depth is 85 m. What is its length at 0.8 m depth as it progresses shoreward? If the celerity at 85 m is C, calculate the celerity at 0.8 m. (ans: at 0.8 m depth wavelength = 20.7 m; at 0.8 m depth celerity = 0.24C)

8. An atmospheric disturbance at sea generates storm waves with a period of 8 sec. Calculate how long it will take the wave energy generated by the storm to reach a beach 800 km away. (ans: 64,114 s = 17.81 h)

9. If a seismic disturbance generates waves with a period of 15 minutes, calculate the length of time it will take the waves to go 800 km. Assume the mean depth of the water to be 4 km. (ans: 4041 s = 1.12 h)

10. A displacement-type ship hull generates a water wave whose maximum length approximates 150 m, the waterline length of the vessel. The ship can move efficiently through the water at speeds up to that at which the maximum-length wave propagates. Calculate the maximum efficient hull speed: Assume that the draft of the vessel is 7 m. If the ship passes over a shoal 12 m deep, what happens to its speed and why? (ans: In deep water maximum efficient hull speed = 15.3 m/s; when passing over shoal it becomes a shallow water wave and maximum efficient hull speed = 7.0 m/s)