Self administered feedback test for PHYS1169

Time allowed: 5 minutes reading and 40 minutes working.

This test will not contribute to your marks. Its only function is to give you feedback about how you are going. You should be ready to do this test before the end of the fifth week on this syllabus material.

You will administer it and mark it yourself, using the answers and marking scheme that can be downloaded from your course site.

Question 1 (14 marks)

a) Write the equations for two travelling waves which together in superposition could produce a standing wave.

b) Make three sketches of a *standing* wave. The first should be at a time of maximum displacement (t = 0), the second one quarter of a period later (t = T/4), and the third another quarter period later (t = T/2).

c) In a building designed by a prominent Sydney architect, rigging cables are used as structural elements. One such cable is 8 m long, 8 mm in diameter, and subject to a tension of 7.0 kN under a particular set of load and wind conditions. The cable is made of an alloy with a density of 5,600 $kg.m^{-3}$.

   i) Estimate the first 5 resonant frequencies of the cable.

   ii) Briefly explain how the phenomenon of resonance could be important in this instance.

Question 2 (11 marks)

a) A plane in the air radiates a sound power of 800 W uniformly in all directions.

   i) Determine the sound intensity at a distance of 100 m from the plane. Show your working.

   ii) Determine the sound intensity level at a distance of 100 m from the plane

b) A plane on the ground radiates a sound power of 800 W uniformly in all directions. Treat the ground as a perfect reflector of sound.

   i) Determine the sound intensity at a distance of 100 m form the plane. Show your working.

   ii) Determine the sound intensity level at a distance of 100 m form the plane.

c) In still air, how fast must a moving sound source travel towards a stationary observer if the stationary observer measures the frequency of the sound to be 10% higher than the frequency emitted by the source? (Speed of sound = 340 ms^{-1}.)