**ELEC1206 Exercise Questions**

**Question 1:** In an oscillating LC circuit in which \( C = 6.00 \mu F \), the maximum potential difference across the capacitor during the oscillations is 1.50 V and the maximum current through the inductor is 50.0 mA.

(a) What are the inductance \( L \) and the frequency of the oscillations?

(b) How much time is required for the charge on the capacitor to rise from zero to its maximum value?

**Question 2:** A standing wave results from the sum of two transverse waves given by

\[
y_1 = 0.050 \cos(\pi x - 4\pi t)
\]

\[
y_2 = 0.050 \cos(\pi x + 4\pi t)
\]

where \( x, y_1, \) and \( y_2 \) are in meters and \( t \) is in seconds.

(a) What is the smallest positive value of \( x \) that corresponds to a node?

(b) Beginning at \( t = 0 \), what are the values of the first, second and third times the particle at \( x = 0 \) has zero velocity?

**Question 3:** A 10 g particle undergoes SHM with an amplitude of 2.0 mm, a maximum acceleration of magnitude 6500 m/s\(^2\), and an unknown phase constant \( \phi \).

(a) What is the period of the motion?

(b) What is the maximum speed of the particle?

(c) What is the total mechanical energy of the oscillator?

(d) What is the magnitude of the force when the particle is at its maximum displacement?

(e) What is the magnitude of the force when the particle is at half its maximum displacement?

**Question 4:** A plane electromagnetic wave traveling in the positive direction of an \( x \) axis in vacuum has components \( E_x = E_y = 0 \) and

\[
E_z = (2.0 \, \text{V/m}) \cos \left[ (\pi \times 10^{15} \, \text{s}^{-1}) (t - \frac{x}{c}) \right]
\]

(a) What is the amplitude of the magnetic field component?

(b) Parallel to which axis does the magnetic field oscillate?

(c) When the electric field component is in the positive direction of the \( z \) axis at a certain point \( P \), what is the direction of the magnetic field component there?
**Question 5:** A SHM consists of a block of mass 2.00 kg attached to a spring of spring constant 100 N/m. When $t = 1.00s$, the position and velocity of the block are $x = 0.129m$ and $v = 3.415m/s$.

(a) What is the amplitude of the oscillations?

(b) What was the position at $t = 0s$?

(c) What was the velocity at $t = 0s$?