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Answer the following questions:

- 1- (a) Describe the different types of " Damped Oscillations". (15 Marks)
(b) A mass of 2.5kg is attached to a spring with a force constant 600 N/m. Determine the value of the damping constant "b" that is required to produce the critical damping.

- 2- (a) What are the kinds of waves ? (15 Marks)
(b) Prove that the wave
$$Y(x,t) = A \cos (kx + \omega t + \phi)$$
Is traveling in the (-x) direction.

- 3- There's a standing wave at 789 Hz in this 1.8 m tube (15 Marks)



- (a) which harmonic is it ?
(b) find λ .
(c) what is the fundamental frequency?
- 4- (a) Prove that the speed of sound in a gas is equal to (15 Marks)

$$v = \sqrt{\frac{\gamma RT}{M}}$$

V: Sound speed in gases
 γ : adiabatic constant
R: gas constant
M: molecular mass of gas
T: absolute temperature

- (b) A sound wave is sent from a ship to the ocean floor, where it is reflected and returned. If the round trip takes 0.6 s, how deep is the ocean floor?
Consider the bulk modulus for sea water to be 2.1×10^5 Pa and its density to be 1030 kg/m^3 .

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5- An object is placed 30 cm from a convex lens with focal length of 10 cm.

(a) construct a ray diagram

(b) find the image distance.

(15 Marks)

6- (a) Describe the photoelectric effect.

(15 Marks)

(b) A sodium metal is illuminated with light having a wavelength of 300 nm.

The work function of the metal is 2.46 eV. Find:

- The maximum kinetic energy of the effected photo electrons.

- The cut off wavelength of the sodium.

Best Wishes

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