Assignment

11.15-23

ee23btech11215 - Penmetsa Srikar Varma

Question:

Q23) A narrow sound pulse (for example, a short pip by a whistle) is sent across a medium.
(*a*) Does the pulse have a definite (*i*) frequency, (*ii*) wavelength, (*iii*) speed of propagation?
(*b*) If the pulse rate is 1 after every 20 s, (that is the whistle is blown for a split of second after every 20 s), is the frequency of note produced by whistle equal to 1/20 or 0.05 Hz ?

Solution:

Table of Parameters

Parameter	Name of Parameter
M	Molecular Weight of gas
γ	Adiabatic Constant of gas
T	Temperature of gas
V	velocity of gas
R	Universal Gas Constant
ν	Frequency of Sound wave
λ	Wavelength of Sound wave
A	Amplitude of Sound wave
x,y	Co-ordinates of point on wave
k	wave number
ω	Angular Frequency of wave
t	time

(*a*) Let us assume that sound pulse produced in a medium of gas having a specific molecular weight M and having adiabatic constant γ which is at a constant temperature T
Then velocity V of sound pulse is given by:

$$V = \sqrt{\left(\frac{\gamma RT}{M}\right)} \tag{1}$$

(where R is Universal gas Constant)

Hence from (1) the velocity V of sound wave remains constant but not frequency ν and wavelength λ

(*b*) We know that for a sound pulse travelling in a medium

The general equation of a point on the wave is given by:

$$y = A.sin\left(kx - \omega t\right) \tag{2}$$

And we know the relation that:

$$\nu = \frac{\omega}{2\pi} \tag{3}$$

Hence, The frequency of the note ν produced will not be equal to 0.05 Hz or $\frac{1}{20}$ Hz