Q: (i).For the wave on the string $y(x,t) = 0.06\sin(\frac{2\pi x}{3})\cos(120\pi t)$, do all the points on the string oscillate with the same (a)frequency , (b)phase , (c)amplitude ? Explain your answers.

(ii). What is the amplitude of a point 0.375m away from one end?

Solution:

(i).For the wave on the string , $l = 1.5m$ and $\lambda = 3m$. So, it is clear that $\lambda = \lambda/2$ and for a string clamped at both ends,
it is possible only when both ends behave as nodes and there is only one antinode in between
i.e., whole string is vibrating in one segment only.
(a).Yes, all the sring particles, except nodes, vibrate with the same frequency v = 60 Hz and the frequency of nodes is zero.

(b).All the particles in the wire lie in one segment; thus, they all have the same phase. Except for the nodes.

(c).Amplitude varies from particle to particle. At antinode, amplitude = 2A = 0.06 m. It gradually falls on going towards nodes and at nodes, it is zero.

(ii).given the equation of wave; $y(x,t) = 0.06\sin(\frac{2\pi x}{3})\cos(120\pi t)$, x=0.375m

$$amplitude = 0.06 sin(\frac{2\pi(0.375)}{3}) \tag{1}$$

$$= 0.06\sin(\frac{\pi}{4}) \tag{2}$$

$$= 0.042m. \tag{3}$$