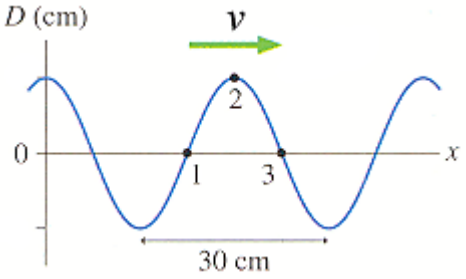
Q- Q- Figure shows a snapshot graph of a wave traveling to the right along a string at 55 m/s. Each interval on the vertical axis corresponds to 0.5 cm. At this instant, what is the velocity of points 1, 2, and 3 on the string?

From the figure



The amplitude of the wave is

$A = 0.5 \text{ cm} = 0.005 \text{ m}$

The wave length

$\lambda = 30 \text{ cm} = 0.30 \text{ m}$

Thus, the frequency of the wave will be

$n = v/\lambda = 55/0.30 = 183.33 \text{ Hz}$

and the angular frequency

$\omega = 2 \pi n = 366.67 \pi \text{ rad/s}$

As in a wave motion all particles of the medium are executing simple harmonic motion and at equilibrium their speed is maximum and given by

$$v_{max} = A \omega$$

Thus, the speed of points 1 and 3 is maximum at this instant and is given by

$$v_{max} = A \omega = 0.005*366.67 \pi = 5.76 \text{ m/s}$$

As the wave move forward point 1 will come down (creating trough) hence its velocity will be negative or $v_1 = -5.76$ m/s while point 3 will go up (creating crest) and its velocity $v_3 = +5.76$ m/s.

As at this instant particle 2 is at maximum displacement position its velocity will be zero.