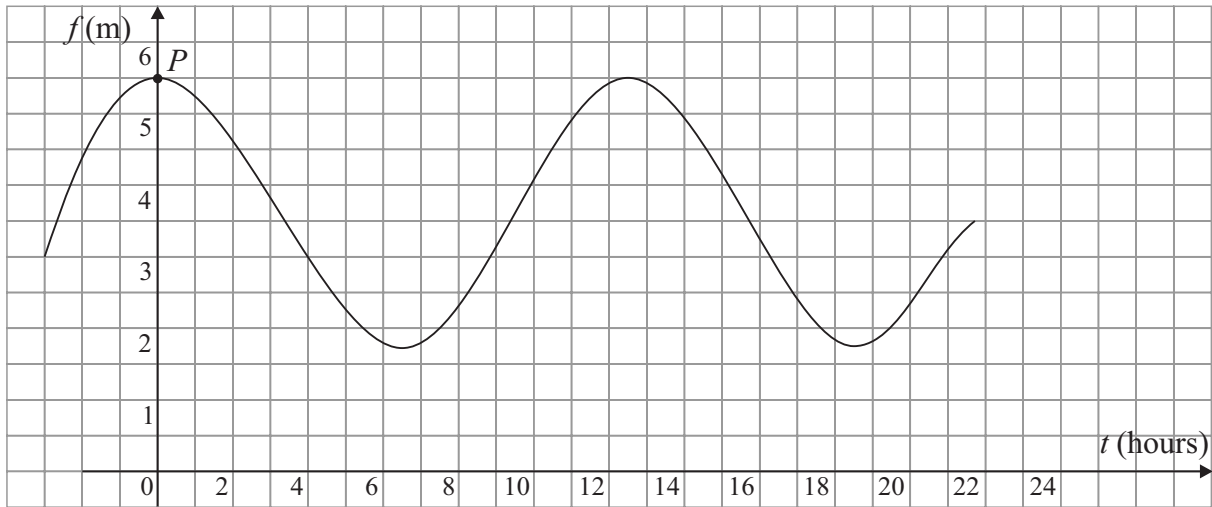


LC 2017 (SET A): PAPER 1

QUESTION 9 (40 MARKS)

Question 9 (a)



Question 9 (b) (i)

$$f(t) = a + b \cos ct$$

$$\text{Range} = [a - b, a + b] = [1.7, 5.5]$$

$$a - b = 1.7 \dots (1)$$

$$a + b = 5.5 \dots (2)$$

$$2a = 7.2 \Rightarrow a = 3.6$$

$$\text{Into (2): } 3.6 - b = 1.7 \Rightarrow b = 1.9$$

$$y = a + b \cos kx$$

$$\text{Period } P = \frac{2\pi}{k}$$

$$\text{Range} = [a - b, a + b], b > 0$$

Question 9 (b) (ii)

High tide: $t = 2:00, 14:34$

$$\text{Period } P = 12:34 \text{ hours} = 12 \frac{17}{30} \text{ hours}$$

$$P = \frac{2\pi}{c} = 12 \frac{17}{30} \Rightarrow c = \frac{2\pi}{12 \frac{17}{30}} = 0.5$$

Question 9 (c)

$$f(t) = 3.6 + 1.9 \cos 0.5t = 5.2$$

$$1.9 \cos 0.5t = 1.6$$

$$\cos 0.5t = \frac{16}{19} \Rightarrow 0.5t = \cos^{-1}\left(\frac{16}{19}\right) = 0.57 \text{ (Radians)}$$

$$0.5t = \begin{cases} 0.57, 6.853 \text{ [First quadrant]} \\ 5.713 \text{ [Fourth quadrant]} \end{cases}$$

$$t = \begin{cases} 1.14, 13.706 \\ 11.426 \end{cases}$$

1.14 hours = 1 hour 8 mins

11.426 hours = 11 hours 26 mins

13.706 hours = 13 hours 42 mins

Afternoon times: $2:00 + 11:26 = 13:26$; $2:00 + 13:42 = 15:42$

