

- 4 (a) Two waveforms, x_1 and x_2 , are $\frac{\pi}{2}$ rad out of phase as shown in Fig 4.1 where A is the amplitude and T is the period.

displacement

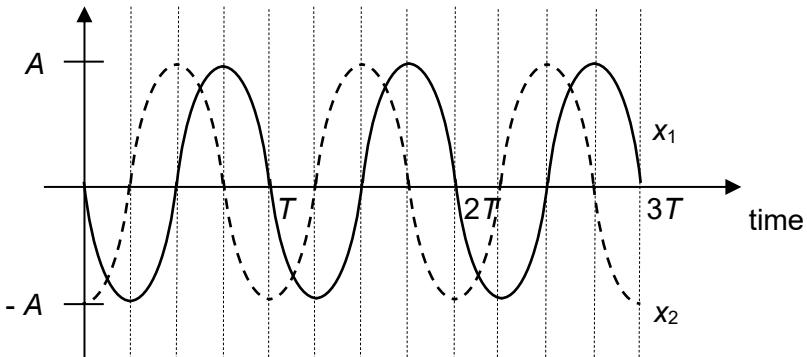


Fig 4.1

resultant
displacement

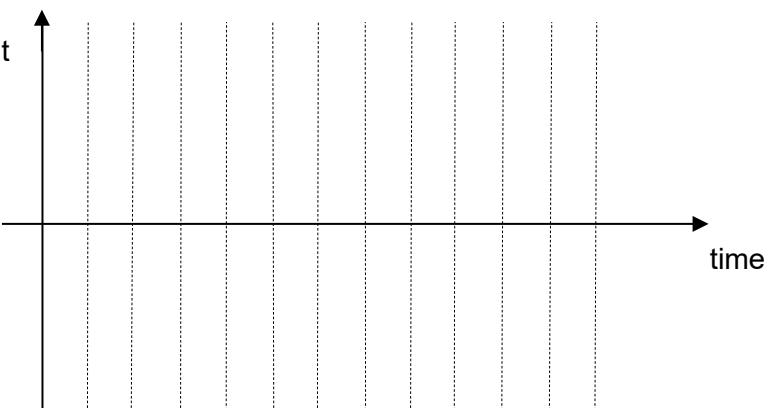


Fig 4.2

- (i) Determine the time in terms of T when x_1 and x_2 have the same displacement.

$$\text{time} = \dots [2]$$

- (ii) Hence, show that the amplitude of the resultant waveform is $A\sqrt{2}$. [2]

(iii) Sketch the resultant waveform in Fig. 4.2.

[2]

- (b) Microwaves are aimed through a small hole, into a “microwave cavity” that consists of a 10.0 cm long cylinder with reflective ends, as shown in Fig. 4.4. The cavity can be assumed to be a compartment with both ends closed.

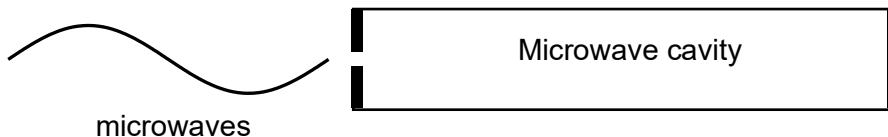


Fig. 4.4

- (i) Calculate the lowest frequency of microwave that can generate a standing wave within this microwave cavity.

frequency = Hz [2]

- (ii) Hence, or otherwise, state two more frequencies between 10 GHz and 13 GHz which can also create standing waves in this microwave cavity.

frequency number 1: GHz

frequency number 2: GHz [2]

