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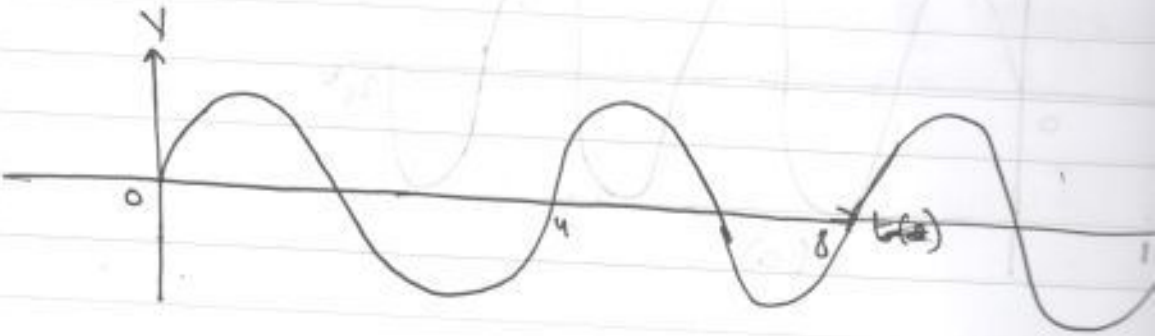
EXAMPLE #1:-



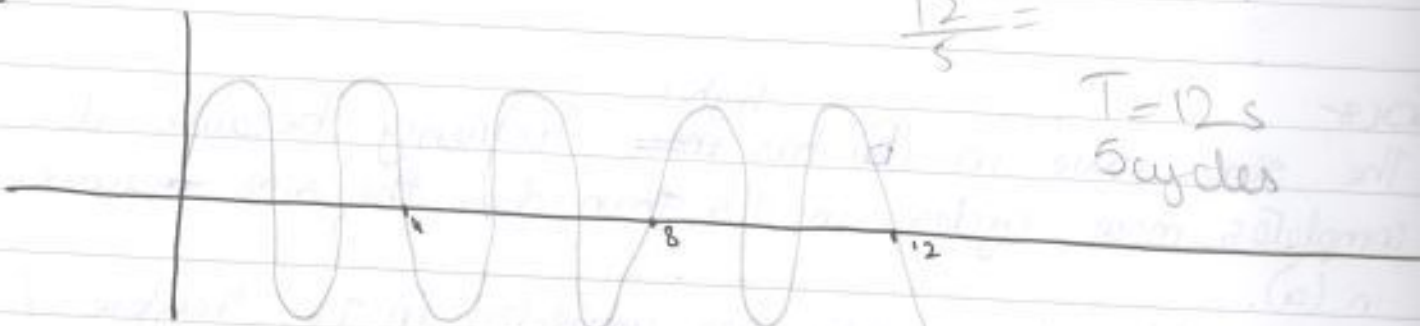
Sol:-

It takes 4 seconds (4s) to complete each cycle. Therefo the period is 4s.

$T = 4s.$

Q:- What is the period if the sine wave goes through fi cycles in 12s?

A:-



$\frac{12}{5} =$

$T = 12s$

5 cycles

$\frac{12}{5} \Rightarrow 2.4$ secs

EXAMPLE #2:-

Which sine wave shown below has a higher frequency? Determine the frequency and the period of both waveforms.

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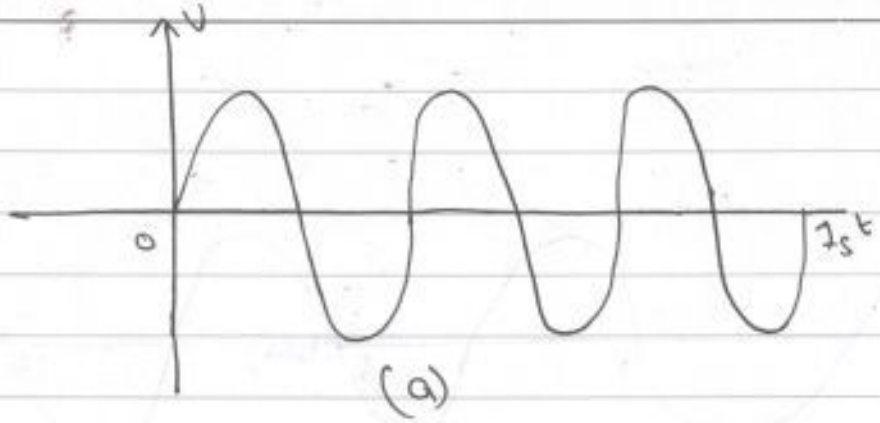
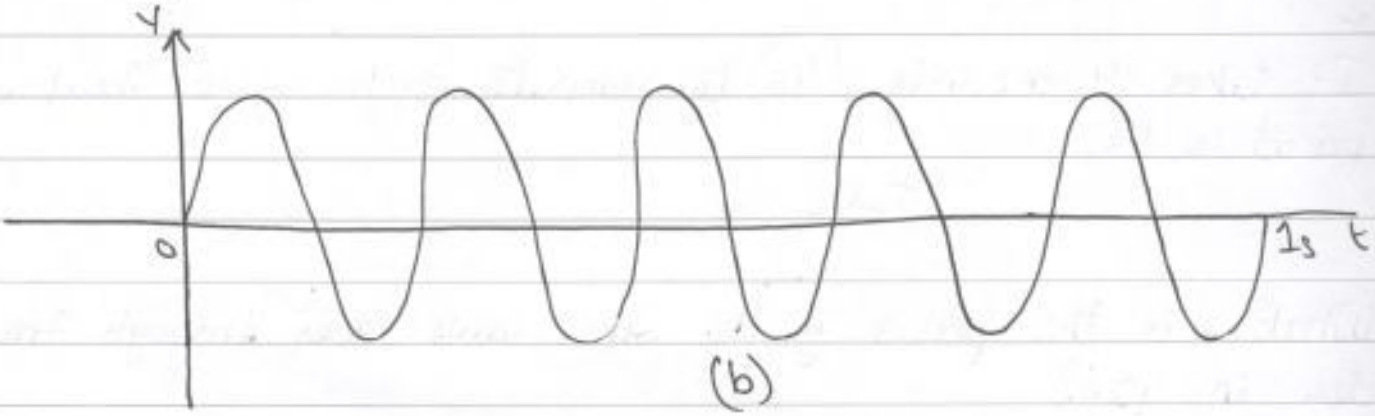


(a)



(b)

Solo

→ The sine wave in (b) has higher frequency because it completes more cycles in 1s than does the sine wave in (a).

→ In fig (a), three cycles are completed in 1s; therefore

$$f = 3Hz$$

→ One cycle takes 0.333 s (one-third second), so the period is

$$T = \frac{1}{f} = \frac{1}{3} \Rightarrow 333ms$$

→ In fig(b), five cycles are completed in 1s; therefore

$$f = 5Hz$$

→ $$T = \frac{1}{f} = \frac{1}{5} \Rightarrow 200ms.$$

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EXAMPLE #3:-

A four-pole generator has a rotation speed of 100rps. Determine the frequency of the output voltage:-

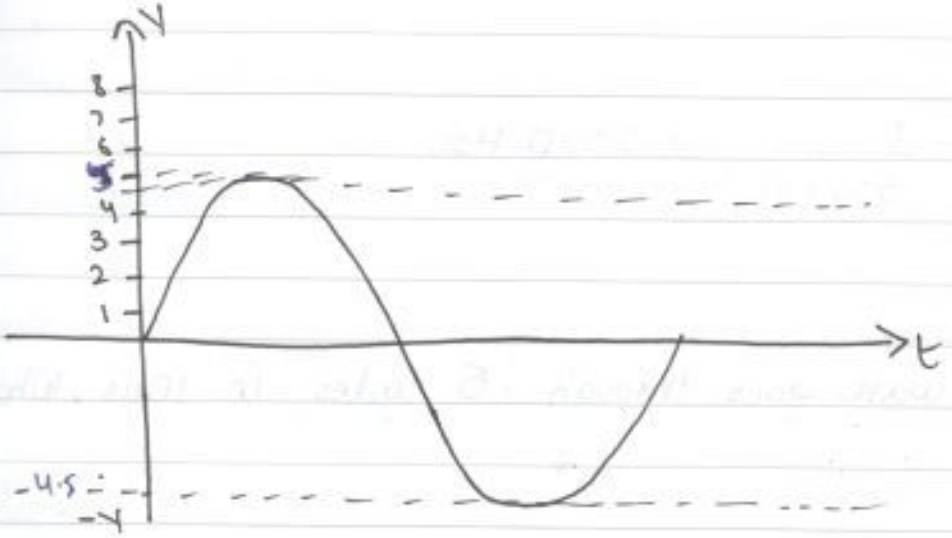
Sol:-

$f = (\text{number of pole pairs})(\text{rps})$

$= 2(100\text{ rps}) \Rightarrow 200\text{Hz}.$

EXAMPLE #4:-

Determine V_p, V_{pp}, V_{rms} and the half cycle V_{avg} for the sine wave shown below:



Sol:-

$V_p = 4.5V$ - read directly from the graph.

$V_{pp} = 2V_p = 2(4.5) \Rightarrow 9V$

$V_{rms} = 0.707V_p = 0.707(4.5V) \Rightarrow 3.18V$

$V_{avg} = 0.637V_p = 0.637(4.5V) \Rightarrow 2.87V.$

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EXERCISE PROBLEMS

THE SINUSOIDAL WAVEFORMS

Q1:- Calculate the frequency for each of the following values of period:-

a) 0.2s

Sol:-

$$f = \frac{1}{T}$$

$$= \frac{1}{0.2s} \Rightarrow 5Hz$$

b) 500 μs -

Sol:-

$$f = \frac{1}{500 \times 10^{-6}} \Rightarrow 2000\ Hz.$$

Q2:- A sine wave goes through 5 cycles in 10μs. What is its period?

Sol:-

$$T = \frac{10\ \mu s}{5\ cycles} \Rightarrow 2\ \mu s$$

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SINUSOIDAL VOLTAGE SOURCES

Q3:- The conductive loop on the rotor of a simple two-pole, single-phase generator rotates at a rate of 250 rps. What is the frequency of the induced output voltage?

Solr

Two-pole single-phase

rate = 250 rps

f = ?

f = 250 rps ans

As frequency is directly proportional to the rate of rotation. As it is single phase then one cycle is one revolution.

SINUSOIDAL VOLTAGE & CURRENT VALUES

Q4:- A sinusoidal current has an rms value of 5mA. Determine the following values:-

a) I_p, peak ?

Solr

$I_{RMS} = 5mA$

$I_p = ?$

$I_{rms} = 0.707 I_p$

$I_p = 1.414 I_{rms}$

$= 1.414 (5mA) \Rightarrow 7.07 mA$

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b) $I_{avg} = ?$

Sol:-

$$I_{avg} = 0.637\, I_p$$

$$= 0.637(7.07\text{mA}) \Rightarrow 4.5\text{ mA}$$, half cycle average value

c) $I_{pp} = ?$

Sol:-

$$I_{pp} = 2.828\, I_{rms}$$

$$= 2.828\ (5\text{mA})$$

$$I_{pp} \Rightarrow 14.14\text{ mA}$$