What is an AC Circuit?

Worksheet

An AC circuit carries current that alternates direction periodically, described by v(t) = Vmaxsin(t), unlike DC which flows in one constant direction.

$$V(t) = V_0 \sin(\omega t)$$

Questions

1. In an AC circuit, the current:

A) Flows only in one direction
B) Reverses direction periodically
C) Is always zero
D) Only exists in DC circuits

2. Standard mains frequency in the United States is:

A) 50 Hz
B) 60 Hz
C) 100 Hz
D) 120 Hz

3. How does the RMS voltage relate to the peak voltage?

A) Vrms = Vmax
B) Vrms = Vmax/2
C) Vrms = 2Vmax
D) Vrms = Vmax

4. Angular frequency equals:

A) 2f
B) f/2
C) 2/f
D) f

5. A US household outlet reads 120 V RMS. Find the peak voltage.

6. European mains runs at f = 50 Hz. Find the angular frequency and period T.

7. Given v(t) = 170sin(377t), find the voltage at t = 2 ms.

8. Define: What is AC?

9. Define: Formula for instantaneous AC voltage?

10. Define: What is the RMS value?

Answer Key

1. B) Reverses direction periodically - AC current alternates direction, typically following a sine wave over time.
2. B) 60 Hz - US mains AC runs at 60 Hz; most of Europe uses 50 Hz.
3. B) Vrms = Vmax/2 - RMS is the effective value, equal to the peak divided by 2 for a sine wave.
4. A) 2f - = 2f converts frequency in Hz to radians per second.
5. Vrms = Vmax/2, so Vmax = Vrms2 Vmax = 120 1.4142 = 169.7 V
6. = 2f = 250 = 314.16 rad/s T = 1/f = 1/50 = 0.02 s = 20 ms
7. t = 377 0.002 = 0.754 rad sin(0.754 rad) 0.685 v = 170 0.685 116.4 V
8. Alternating current - current that periodically reverses direction, typically following a sine wave.
9. v(t) = Vmaxsin(t).
10. The effective DC-equivalent value of an AC signal: Vrms = Vmax/2.