

Easy

Deputy Executive Engineer (Electrician) 2026

Gujarat Public Service Commission / Assistant Engineer (Electrical)

An AC voltage is given by $v(t) = 100 \sin(\omega t)$. Then 1. Peak voltage is 100 V. 2. RMS voltage is $100/\sqrt{2}$. 3. RMS value 70.7 V. 4. Average value over full cycle

A

1 and 2 only

B

2 and 4 only

C

1, 2 and 3 only

Correct

D

All of the above

Correct Answer: C

Full Detailed Explanation

Correct Answer: C - 1, 2 and 3 only
Quick Concept Explanation The average of a rectified sine over a half cycle is $2X_m/\pi$, giving sine-wave form factor RMS/average-rectified = 1.11. For $v(t)=100 \sin \omega t$, $V_m=100$ V and $V_{rms}=V_m/\sqrt{2}=70.7$ V. The full-cycle average of a sine wave is zero. Key relation: $X_{rms}=X_m/\sqrt{2}$; $X_{avg}(\text{rectified})=2X_m/\pi$; form factor = 1.11. Exam focus: Check whether the question asks full-cycle average or rectified average. Common trap: Using the half-cycle average as the full-cycle average is a common error. Statement-wise Verification
Statement 1 - Correct. Peak voltage is 100 V. For $v(t)=100 \sin \omega t$, $V_m=100$ V and $V_{rms}=V_m/\sqrt{2}=70.7$ V. Statement 2 - Correct. RMS voltage is $100/\sqrt{2}$. For $v(t)=100 \sin \omega t$, $V_m=100$ V and $V_{rms}=V_m/\sqrt{2}=70.7$ V. Statement 3 - Correct. RMS value = 70.7 V. For $v(t)=100 \sin \omega t$, $V_m=100$ V and $V_{rms}=V_m/\sqrt{2}=70.7$ V. Statement 4 - Incorrect. Average value over full cycle is 100 V. The correct principle is: The full-cycle average of a sine wave is zero. Core Concept For a sine wave $x(t)=X_m \sin \omega t$, the RMS value is $X_m/\sqrt{2}$. The average over a complete cycle is zero because positive and negative halves cancel. The average of a rectified sine over a half cycle is $2X_m/\pi$, giving sine-wave form factor RMS/average-rectified = 1.11. Formula / Key Relationship $X_{rms}=X_m/\sqrt{2}$; $X_{avg}(\text{rectified})=2X_m/\pi$; form factor = 1.11. Step-by-Step Check For