

Easy

Deputy Executive Engineer (Electrician) 2026

Gujarat Public Service Selection Board / Assistant Engineer (Electrical)

A single-phase half-wave rectifier has input RMS voltage 100 V. Then 1. Peak voltage 141 V. 2. DC output 45 V. 3. Output is pulsating DC. 4. Efficiency is

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 An ideal half-wave rectifier passes one half-cycle of a sinusoidal input and blocks the other, creating pulsating DC.

$V_m = \sqrt{2} \times 100 = 141.4 \text{ V}$ and ideal half-wave average $V_{dc} = V_m / \pi = 45.0 \text{ V}$. Key relation: $V_{m} = \sqrt{2} V_{rms}$; $V_{DC} = V_m / \pi$; $\eta_{max} = 40.6\%$. Exam focus: Remember π in half-wave average; full-wave uses $2V_m / \pi$. Common trap: Do not confuse diode ideality with 100% rectification efficiency.

Statement-wise Verification Statement 1 - Correct. Peak voltage 141 V. $V_m = \sqrt{2} \times 100 = 141.4 \text{ V}$ and ideal half-wave average $V_{dc} = V_m / \pi = 45.0 \text{ V}$. Statement 2 - Correct. DC output 45 V. $V_{m} = \sqrt{2} V_{rms}$; $V_{DC} = V_m / \pi$; $\eta_{max} = 40.6\%$. Statement 3 - Correct. Output is pulsating DC. An ideal half-wave rectifier passes one half-cycle of a sinusoidal input and blocks the other, creating pulsating DC. Statement 4 - Incorrect. Efficiency is 100%. A half-wave rectifier has a theoretical maximum rectification efficiency of about 40.6%, even with an ideal diode Core Concept An ideal half-wave rectifier passes one half-cycle of a sinusoidal input and blocks the other, creating pulsating DC. For a sinusoidal input with RMS value V_{rms} , $V_m = \sqrt{2} V_{rms}$ and the ideal average output is V_m / π . Its maximum rectification efficiency is about 40.6%, not 100%.

Formula / Key Relationship $V_{m} = \sqrt{2} V_{rms}$; $V_{DC} = V_m / \pi$; $\eta_{max} = 40.6\%$. Step-by-Step Check