

Easy

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For a DC-DC Boost Converter, consider the following:

1. It can produce an output voltage lower than the input if the duty cycle is less than 0.5.
2. The switch is subjected

A

2 only

B

1 and 2 only

C

2 and 3 only

Correct

D

1, 2 and 3

Correct Answer: C

Full Detailed Explanation

Correct Answer: C - 2 and 3 only

Quick Concept Explanation An ideal boost converter in continuous conduction has an output voltage greater than or equal to input for $0 \leq D \leq 1$. The output capacitor supplies load current between energy-transfer intervals and reduces output ripple. Key relation: $V_o = V_{in} / (1 - D)$; $I_L = V_{in} D / (L f_s)$. Exam focus: For an ideal boost, $D = 1 - V_{in} / V_o$. Common trap: A normal boost converter cannot produce $V_o \leq V_{in}$ merely because $D \leq 0.5$.

Statement-wise Verification

Statement 1 - Incorrect. It can produce an output voltage lower than the input if the duty cycle is less than 0.5. An ideal boost converter has $V_o = V_{in} / (1 - D)$, so V_o cannot be below V_{in} for $0 \leq D \leq 1$.

Statement 2 - Correct. The switch is subjected to the full output voltage when it is OFF. When the switch is off, it must block approximately the output voltage.

Statement 3 - Correct. The output capacitor reduces voltage ripple. The output capacitor supplies load current between energy-transfer intervals and reduces output ripple.

Core Concept An ideal boost converter in continuous conduction has an output voltage greater than or equal to input for $0 \leq D \leq 1$. When the switch is off, it must block approximately the output voltage. The output capacitor supplies load current between energy-transfer intervals and reduces output ripple.

Formula / Key Relationship