

Medium

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Consider the following statements regarding Maximum Power Transfer: 1. Maximum power transfer occurs when load resistance equals source resistance in DC circuits.

A

1 and 4 only

B

1, 2 and 3 only

Correct

C

2 and 3 only

D

All of the above

Correct Answer: B

Full Detailed Explanation

Correct Answer: B - 1, 2 and 3 only Quick Concept Explanation In AC, Z_L must equal the complex conjugate of source/Thevenin impedance. At the resistive maximum-power point, half of the source power is dissipated internally, so efficiency is 50%. Key relation: DC: $R_L = R_{th}$. AC:

$Z_L = Z_{th}^*$. Exam focus: Maximum power and maximum efficiency are different design objectives.

Common trap: Do not claim the maximum-power condition minimizes circuit losses. Statement-wise

Verification Statement 1 - Correct. Maximum power transfer occurs when load resistance equals

source resistance in DC circuits. In a DC resistive Thevenin equivalent, maximum load power

occurs at $R_L = R_{th}$. Statement 2 - Correct. In AC circuits, maximum power transfer occurs when load

impedance is complex conjugate of source impedance. In AC, Z_L must equal the complex conjugate of

source/Thevenin impedance. Statement 3 - Correct. At maximum power transfer condition, efficiency

of the system becomes 50 percent. At the resistive maximum-power point, half of the source power

is dissipated internally, so efficiency is 50%. Statement 4 - Incorrect. Maximum power transfer

condition ensures minimum losses in the circuit. At the resistive maximum-power condition half

the source power is lost internally, so it is not a minimum-loss operating point Core Concept

Maximum power transfer is a matching condition, not an efficiency condition. In a DC resistive