PIQ Quiz Notes

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Bus Bar Quiz 1

Understanding conductor sizing for laminated bus bars
A bus bar is a single conductor or several layers of rectangular conductors (bars), each separated by a dielectric (insulating material) laminated into an assembly.

Copper or aluminum are the two most commonly used materials for conductors used in electrical equipment.

Answers in orange.

Question 1: Why would a laminated bus bar be used instead of wires?

A. To reduce inductance
B. Replacing wires with a laminated bus bar will maximize space, improving air flow
C. To improve installation and maintenance times
D. All of the above

Explanation

- The parallel, flat design of laminated bus bar conductors provides a greater surface area between plus and minus conductors, resulting in a significant reduction of inductance. Plus, the engineered design is specific to its location within a system for optimized space utilization, which is then easily installed.

Question 2: If a conductor's cross-sectional area is undersize, what are the consequences?

A. Excessive heat generation
B. Higher voltage drop
C. Higher resistance
D. All of the above

Explanation
A properly designed bus bar will operate with less energy loss and lower voltage drop because the resistance to the flow of electrons will be reduced.

Question 3: Can you use the same size cross-sectional area of an aluminum conductor as a copper conductor?

A. Yes
B. No

Explanation

- The conductivity of aluminum is less than copper, requiring more unit area.
- The aluminum conductor should be larger (approximately 2x) the size of the copper conductor.
- Inversely, the electrical resistivity of aluminum is greater than that of copper.
- Electrical resistivity:
  - Aluminum = 3.0×10^{-6} ohm-cm
  - Copper = 1.7×10^{-6} ohm-cm

Question 4: When a number of conductors are used in parallel, one over the top of the other, the nominal ampacity of the conductor is less or greater than that of a single bar?

A. Less
B. Greater

Explanation
This is due to the obstruction to convection and radiation losses from the inner conductors.

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Additional Resources

- Eldre Brochure
- Power Electronics Brochure
- Cooling of Power Electronics Solutions Guide
- R-Tools 3D Heatsink Thermal Modeling Tool

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