

Hard

Assistant Engineer (Electrical), Class 2025

Building Department

A 400-V, 1000-A, lap wound DC machine has 10 poles, 860 armature conductors. The number of conductors in the pole face to give full compensation if pole face covers 70%

A

3010

Correct

B

4300

C

2400

D

2800

Correct Answer: A

Full Detailed Explanation

Concept & Reasoning In a lap-wound DC machine the number of parallel armature paths A equals the number of poles P . Armature ampere-turns per pole are proportional to $ZI_a/(2AP)$. Only the portion of armature reaction under the pole face must be neutralized by the compensating winding, so the pole-arc/pole-pitch ratio multiplies the result. With $Z=860$, $I_a=1000$ A, $A=P=10$ and pole arc ratio 0.7: $AT/pole = 860 \times 1000 / (2 \times 10 \times 10) = 4300$ AT/pole. Compensating requirement under the pole face = $0.7 \times 4300 = 3010$ AT/pole. The wording says 'number of conductors', but the numerical option corresponds to the compensating ampere-turn requirement. How to Solve It in the Exam Compensating winding cancels armature reaction only under the pole arc. Important Exam Point Use $A=P$ for lap winding before substituting. Related Revision Path This question sits in the revision path Electrical Machines → DC Machines → Armature Reaction .

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