higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

ARMATURE WINDING N2

(11020042)

15 April 2021 (X-paper)
09:00–12:00

A calculator may be used

This question paper consists of 5 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
ARMATURE WINDING N2
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. All diagrams must be neat and in proportion.
5. Use the value of π as 3,142.
6. Write neatly and legibly.

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QUESTION 1

1.1 Name TWO main types of winding in DC. (2)

1.2 Make TWO neat diagrams to indicate the difference between progressive and retrogressive winding. (4)

1.3 What is the purpose an overload coil in a DC starter? (3)

1.4 Explain Faraday's law of electromagnetic induction. (3)

1.5 Make a simple drawing to shown how a field coil can be tested by using a transformer test. (4)

1.6 Make a neat diagram to show the characteristics of a series generator. (4)

1.7 Name TWO methods used to counteract armature reaction. (2)
[22]

QUESTION 2

2.1 Draw a neat diagram of a self-excited shunt generator. (6)

2.2 Name TWO factors that should be considered when selecting brushes. (2)

2.3 An eight-pole lap-wound armature rotates at 480 rpm and is required to deliver 00 V. The flux per pole is 0,888 Wb. If the armature has 55 slots and draws a current of 80 A, calculate:

2.3.1 The number of conductors per slot (4)

2.3.2 Torque developed by the windings (4)

2.4 The armature current of a DC shunt machine is 10 A. The motor is operating at a terminal voltage of 220 V when the resistance is 1,8 Ω.

Calculate the EMF when the motor is connected in the following configurations

2.4.1 Generator (2)

2.4.2 Motor (2)
[20]

QUESTION 3

3.1 A split-phase motor has been brought to your company for a rewind.

Make a neat detailed data sheet that can be used to rewind that motor to original specifications. (10)

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3.2 Name FOUR tests that can be done on an armature after rewinding. (4)

3.3 Explain the following terms:

3.3.1 Screen protected type

3.3.2 Drip-proof type

3.3.3 Open type

(3 × 2) (6)
[20]

QUESTION 4

4.1 A series RL circuit consists of the following components:
R = 20 Ω; L = 25 mH. These components are connected across a supply of 200 V/50 Hz.

Calculate the following:

4.1.1 The inductive reactance of the coil (2)

4.1.2 The impedance of the circuit (2)

4.1.3 The current in the circuit (2)

4.1.4 Phase angle between the current and the voltage (2)

4.1.5 The voltage drops across each component (4)

4.2 Draw a neat diagram of a capacitor-start-and-run motor. (4)

4.3 Name TWO types of capacitors. (2)

4.4 What is the purpose of the centrifugal switch in a split-phase motor? (2)
[20]

QUESTION 5

5.1 Draw a neat diagram of a three-phase wound rotor induction motor. (5)

5.2 How would one reverse the direction of rotation of a three-phase slipring motor? (2)

5.3 Make a neat labelled diagram of a basic transformer. (3)

5.4 Explain the term, *eddy currents.* (2)

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5.5 A single-phase transformer has 600 turns on the primary winding supplied from 220 volts AC.

Determine the following:

5.5.1 The number of turns on the secondary winding if it is required to supply a secondary voltage of 16 volts.

5.5.2 The primary current if the secondary current is 5A.

5.5.3 The rating of the transformer in VA.

(3 × 2) (6)
[18]

TOTAL: 100

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