higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTROTECHNOLOGY
NQF LEVEL 3

(12040423)

10 December 2020 (Y-paper)
13:00–16:00

This question paper consists of 8 pages.

493Q1N2010

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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. Write neatly and legibly.

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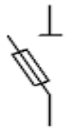
QUESTION 1

1.1 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–F) next to the question number (1.1.1–1.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.1.1	Supports brushes and connecting wires	A	yoke
1.1.2	Attached to two ends of yoke and supports the bearings	B	commutator
1.1.3	Main frame of DC machine	C	brushes
1.1.4	Cylinder at one end of shaft, made up of number of hard-drawn copper segments	D	end housing (shields)
1.1.5	Made of carbon and graphite mixtures	E	brush holders
		F	pole core

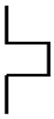
(5 × 1) (5)

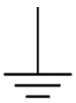
1.2 Identify each of the following symbols in electrical diagrams:

1.2.1 

1.2.2 

1.2.3 

1.2.4 

1.2.5 

(5 × 1) (5)

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1.3 Explain how the field coils and armature are connected with each other in each of the following:

1.3.1 Series motor

1.3.2 Shunt motor

1.3.3 Short-shunt compound motor

1.3.4 Long-shunt compound motor

(4 × 1) (4)

1.4 A 13 kW DC motor draws 50 amperes from a 300-volt supply.

HINT: $P = V \times I$

Calculate each of the following:

1.4.1 Power input in kW (1)

1.4.2 Efficiency of motor (3)

1.4.3 Total losses in motor (2)

[20]

QUESTION 2

2.1 Explain how low-voltage protection or under-voltage protection is achieved in motor starters. (2)

2.2 Explain each of the following terms regarding protection against harmful effects of leakage current:

2.2.1 Bonding

2.2.2 Earthing

2.2.3 Supply earth terminal

2.2.4 Earth leakage device

(4 × 2) (8)

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2.3 Give TWO examples of each of the following SABS 0142 requirements for electric drive systems:

2.3.1 Compliance

2.3.2 Fundamental requirements

2.3.3 Installation requirements

2.3.4 Special installations or locations

2.3.5 Verification and certification

(5 × 2) (10)
[20]

QUESTION 3

3.1 List SIX safety precautions to consider when installing an electric drive. (6)

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3.2 Explain the purpose of each numbered component in FIGURE I. Write the answer next to the question number (3.2.1–3.2.8) in the ANSWER BOOK.

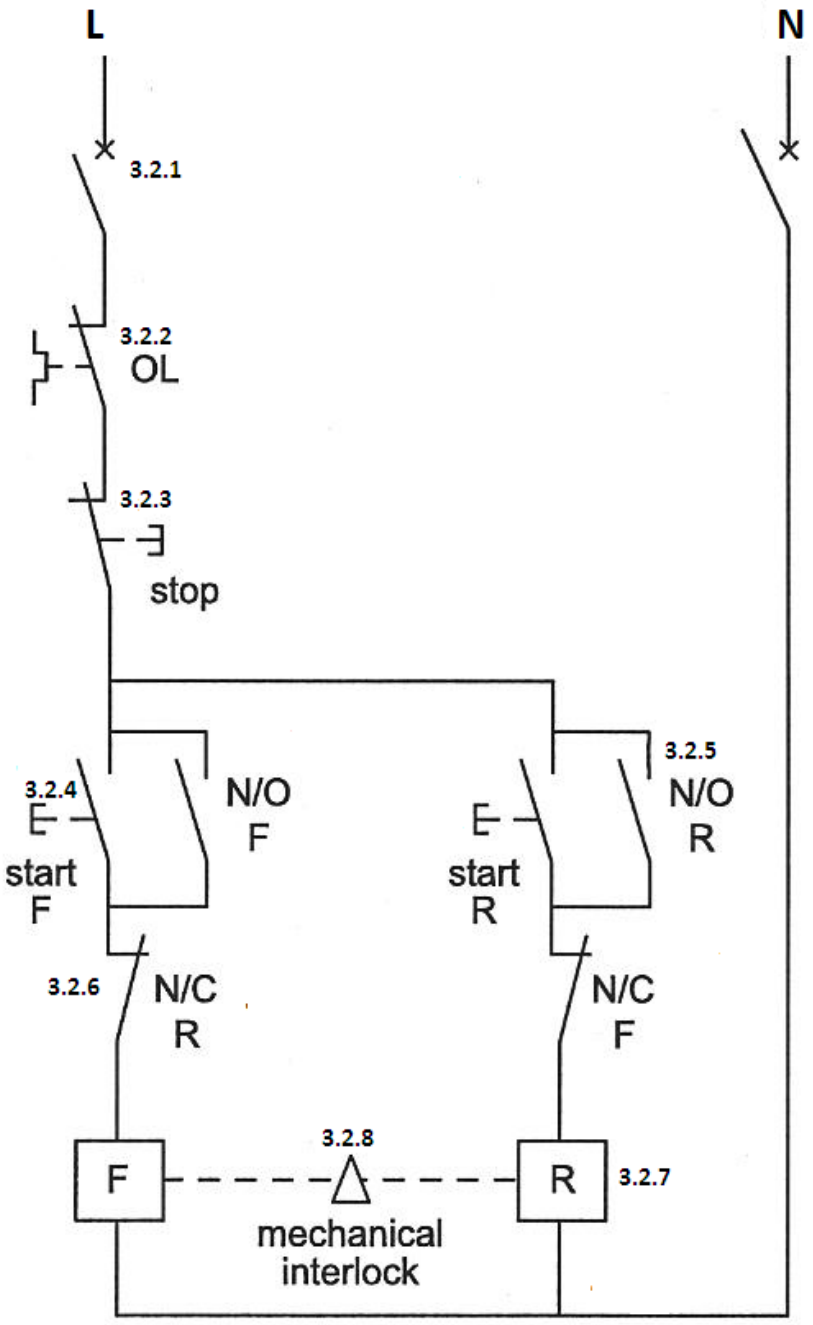

FIGURE 1

(8 × 1) (8)

3.3 List SIX tools required to install the drive in FIGURE 1. (6)

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3.4 State the SANS 10142 regulations concerning each the following:

3.4.1 Current-carrying capacity of a circuit conductor for a motor (Regulation 6.2.2.1.1)

3.4.2 Circuit supplying TWO or more motors (Regulation 6.2.2.1.2)

(2 × 3) (6)

3.5 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (3.5.1–3.5.4) in the ANSWER BOOK.

3.5.1 Joints and terminations shall not adversely affect the current-carrying capacity of the conductors, the earth continuity or the insulation resistance of the cable.

3.5.2 Joints and terminations shall be made in any connector, bend, elbow or tee-piece of the conduit.

3.5.3 Joints and terminations shall allow the strands of a stranded conductor to spread.

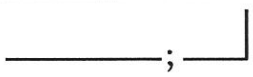
3.5.4 Joints and terminations shall not require strands of a stranded conductor to be cut away to allow the connection of conductors.

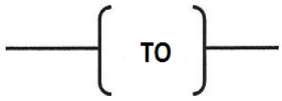
(4 × 1) (4)

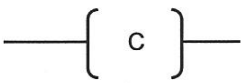
[30]

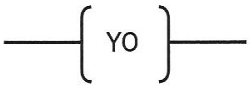
QUESTION 4

4.1 Name and fully describe each of the following control symbols:

4.1.1 

4.1.2 

4.1.3 

4.1.4 

4.1.5 

(5 × 2) (10)

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4.2 Design a relay logic circuit to perform the following functions:

- Light ONE (OFF indicator) must glow to indicate that the contactor coil is not energised.
- Light TWO (ON indicator) must glow to indicate that the contactor coil is energised.

Use the following components in the circuit:

- Stop button
- Start button
- ONE contactor
- TWO lights (10)

[20]

QUESTION 5

5.1 Briefly explain how a rating plate can be used in fault diagnosis. (4)

5.2 List THREE places where commissioning faults can occur. (3)

5.3 Explain the procedure to check or test when a motor has a suspected bearing noise. (3)

[10]

TOTAL: 100

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