higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTROTECHNOLOGY
NQF LEVEL 3

(12040423)

7 November 2018 (X-Paper)
09:00–12:00

This question paper consists of 6 pages.

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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. Draw and label circuit diagrams neatly.
5. Write neatly and legibly.

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QUESTION 1

1.1 Name THREE types of drivers used in mechatronics. (3)

1.2 A mechatronic person is asked to select a DC motor that is capable of a high starting toque.

1.2.1 Draw a fully labelled sketch of the type of DC motor mentioned in QUESTION 1.2. (8)

1.2.2 Name the DC motor in QUESTION 1.2.1. (1)

1.2.3 List THREE types of machines or devices that use this type of DC motor. (3)

1.3 Read the following statements below and state whether they are true or false. Write only TRUE or FALSE next to the question number in your ANSWER BOOK.

1.3.1 A generator supplies a mechanical output from an electrical supply.

1.3.2 Efficiency is the ratio of the output to the input.

1.3.3 Belt drive can transmit power over long distances.

1.3.4 In the hard-wiring control circuit we use a stop push button as a normally close.

1.3.5 A single-phase motor is a self-starting motor.

(5 × 1) (5)

[20]

QUESTION 2

2.1 Draw a fully labelled diagram of the main contacts of a contactor. (6)

2.2 Briefly explain what is meant by *direct on line*. (2)

2.3 Analyse the control circuit of a single-phase capacitor start induction motor shown in FIGURE 1 (below) and answer the questions.

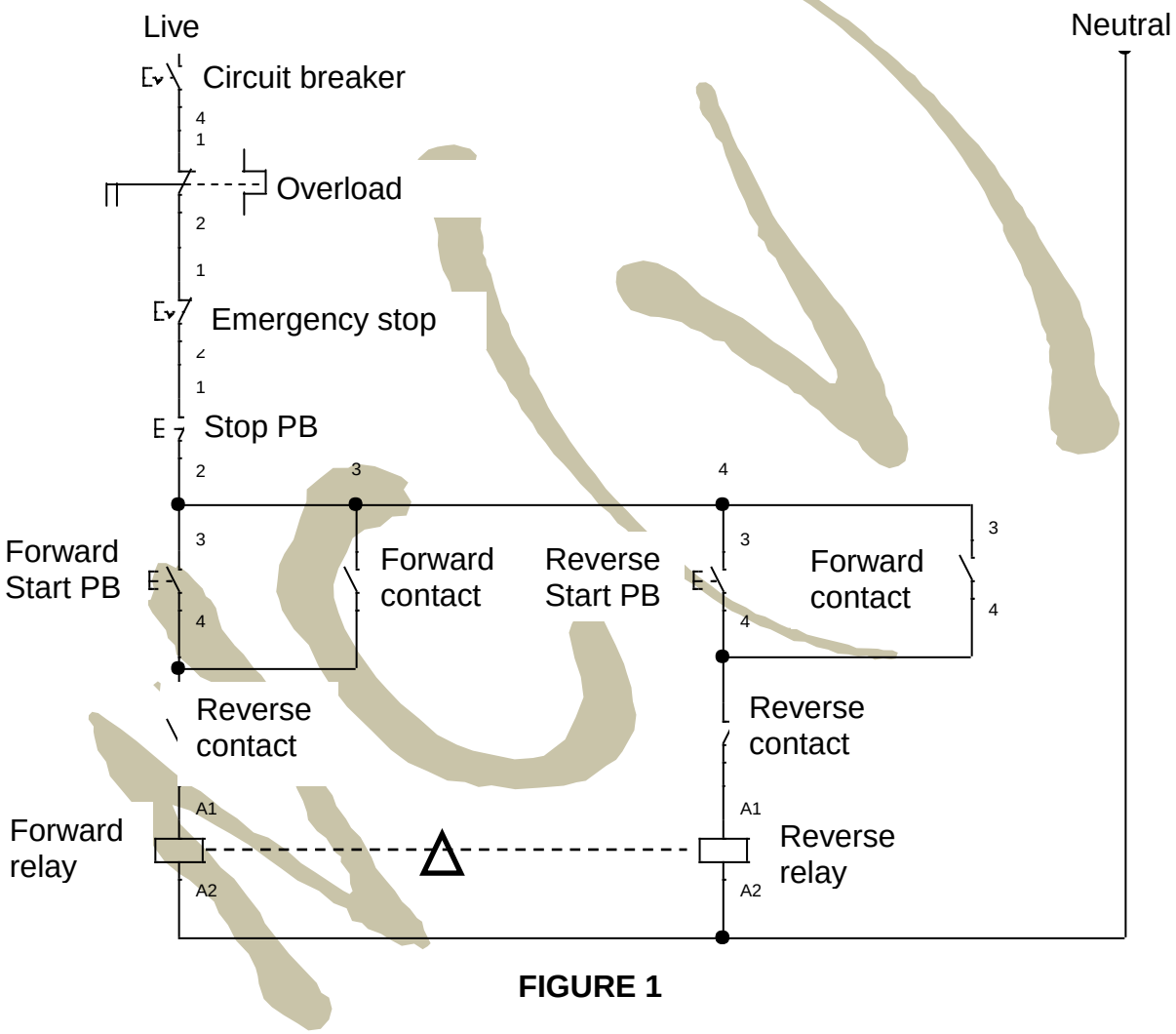


FIGURE 1

2.3.1 What would be the reason if, when pressing the forward start push button, the motor does not start? (2)

2.3.2 What would be the reason if, when pressing the reverse start push button, the motor does not continue to run in reverse mode? (2)

2.3.3 Redraw FIGURE 1 indicating the correct contacts for the control circuit to work properly. (4)

2.4 Briefly explain the operating procedure of an overload protection unit used in all control circuits for DC motors. (4)

[20]

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QUESTION 3

3.1 Identify SIX important things the mechatronic person must be aware of before installing a new drive. (6)

3.2 A mechatronic person is asked to interpret electrical wiring diagrams and perform maintenance on a 230VAC control circuit

Answer the following questions connected to the above statement:

3.2.1 What type of supply is needed? (1)

3.2.2 What safety components are needed for protection? (6)

3.3 After the conveyor belt was replaced, the conveyor motor moved only in the reverse direction. It is suspected that the start push button is faulty and the latching contact damaged.

Explain in your own words how you would fix the problem. (7)
[20]

QUESTION 4

4.1 Write down FOUR advantages for using a relay logic over hard wiring. (4)

4.2 Design the relay logic control circuit for forward and reverse. (12)

4.3 Explain the following terms related to the relay logic circuit.

4.3.1 Output

4.3.2 Element

4.3.3 Relay

4.3.4 Edit

(4 × 1) (4)
[20]

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QUESTION 5

5.1 Briefly explain how the rating plate can be used in fault diagnosis. (3)

5.2 The mechatronic person is asked to repair a motor circuit where the motor does not start when it is switched on.

Write down the sequence of the procedure that needs to be followed to repair the motor circuit. (13)

5.3 Name FOUR sections where commissioning faults can occur. (4)

[20]

TOTAL: 100

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