higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

FAULT FINDING AND PROTECTIVE DEVICES N5

(8080115)

8 April 2021 (X-paper)
09:00–12:00

Drawing instruments may be used.

This question paper consists of 6 pages.

086Q1A2108

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
FAULT FINDING AND PROTECTIVE DEVICES N5
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

Design and draw only the control circuit of a sequence starter using the information below.

Motor A starts when the start button is pressed. After 10 seconds, the same start button is pressed and motor B starts. After a further 10 seconds motor A and B stop at the same time.

NOTE: All coils are 380 V and the two timers are set at 10 seconds. **[10]**

QUESTION 2

2.1 During operation excessive sparking takes place between the brushes and a commutator.

Give FOUR methods to minimise this sparking and to improve commutation. (4)

2.2 Why is bucking sometimes used in electrical motors? (2)

2.3 The construction of a DC motor is similar to that of a DC generator.

Explain the functions of each of the following components regarding these machines:

2.3.1 Pole shoe

2.3.2 Field winding

(2 × 2) (4)
[10]

QUESTION 3

3.1 A kick neutral test is normally performed on electrical motors to obtain the neutral point of brushes on a commutator.

Make a neatly labelled sketch of a kick neutral test. (5)

3.2 Draw a simple sketch to show the construction of the Martindale instrument. (5)
[10]

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QUESTION 4

4.1 Use labelled, freehand drawings to show the dynamic breaking of a direct-current motor. Show the direction of current flow before and during the dynamic braking. (8)

4.2 Dynamic breaking reduces the rotating speed of the armature or rotor in an induction motor before mechanical brakes is applied.

Give TWO ways in which dynamic breaking can be applied in motors. (2)
[10]

QUESTION 5

5.1 Name THREE factors that influence deflection sensitivity in a cathode-ray tube. (3)

5.2 What is the purpose of the X- and Y-deflection plates used in a cathode-ray oscilloscope? (2)

5.3 State FIVE rules to which should be adhered before working on dead apparatus. (5)
[10]

QUESTION 6

6.1 Name FOUR special features of an X-Y plotter. (4)

6.2 State FOUR advantages of an X-Y plotter. (4)

6.3 Briefly explain the function of the self-balancing potentiometer used in an X-Y plotter. (2)
[10]

QUESTION 7

7.1 State FIVE characteristics of negative feedback which is a process used to improve the performance of a circuit. (5)

7.2 Draw a diagram of a positive-series voltage regulator. (5)
[10]

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QUESTION 8

8.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (8.1.1–8.1.5) in the ANSWER BOOK.

8.1.1 A NAND gate output is LOW only if all the inputs are HIGH.

8.1.2 A logic gate has one or more output terminals and one input terminal.

8.1.3 Logic gates take input signals and generate signals to output.

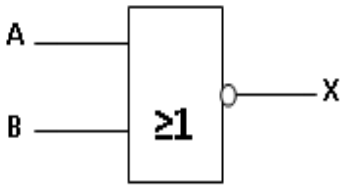
8.1.4 An exclusive-NOR gate output is HIGH when the inputs are unequal.

8.1.5 An inverter output is the complement of its input.

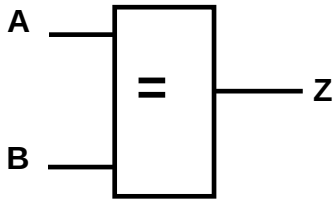
(5 × 1) (5)

8.2 Name each of the following IEC symbols of logic gates:

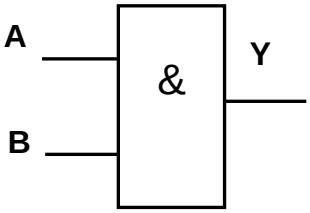
8.2.1



8.2.2



8.2.3



(3 × 1) (3)

8.3 Draw a switching circuit of an OR gate function by using TWO switches. (2)

[10]

QUESTION 9

9.1 Explain shift register. (2)

9.2 Draw a fully labelled circuit diagram of a right-shift register using D-type flip-flops with the features series-input, series-output. (8)
[10]

QUESTION 10

Convert each of the following numbers to the base shown in brackets:

10.1 1000001111_2 (10)

10.2 $85{,}75_{10}$ (2)

10.3 $01110111110{,}1010_2$ (16)

10.4 104_{10} (8)

10.5 471_8 (2)

(5 × 2) **[10]**

TOTAL: 100

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