higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T670**(E)**(A2)T

NATIONAL CERTIFICATE

FAULT FINDING AND PROTECTIVE DEVICES N5

(8080115)

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09:00–12:00

This question paper consists of 5 pages.

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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. Keep subsections of questions together.
5. Write neatly and legibly.

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QUESTION 1

1.1 It is important to note that when designing an electrical circuit, there are many aspects to take into consideration like safety, electrical components and symbols.

Give any THREE protective devices which will break the circuit or cut out the supply during an unwanted condition or faults. (3)

1.2 Name THREE types of contactors used in industry. (3)

1.3 Describe what should be kept in mind when designing a motor control circuit. (4)
[10]

QUESTION 2

The construction of a DC-motor is similar to that of a DC-generator. With respect to these machines, explain the functions of the following components:

2.1 Yoke

2.2 Field pole

2.3 Pole shoe

2.4 Commutator

2.5 Bearings

(5 × 2) **[10]**

QUESTION 3

3.1 Energy can neither be created nor destroyed, but can be converted from one form into another.

Using this statement to explain the function of a DC-generator and DC-motor. (4)

3.2 During operation, excessive sparking takes place between brushes and commutator.

State FOUR methods that can be used to minimise this sparking and improve commutation. (4)

3.3 Name TWO types of brushes used in DC-machines. (2)
[10]

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QUESTION 4

4.1 There are electrical tests that are usually performed on a stator winding of a three-phase motor.

4.1.1 State THREE tests that may be performed on windings of a three-phase motor. (3)

4.1.2 Which tester is used to perform the tests in QUESTION 4.1.1? (1)

4.2 State FOUR faults that may be detected with an induction test. (4)

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

[10]

QUESTION 5

5.1 Describe how a 'drop test' can be done on a DC-motor's armature. (5)

5.2 Under which conditions will a Martindale tester operate or light up a lamp? (5)

[10]

QUESTION 6

6.1 Transistors are electronic devices that are essentially made up of two back-to-back PN- junctions.

State THREE uses of transistors. (3)

6.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (6.2.1–6.2.3) in the ANSWER BOOK.

6.2.1 An SCR has three junctions.

6.2.2 Forced commutation is the method used to switch an SCR 'ON'.

6.2.3 Holding current is the minimum current required to keep the SCR in the conducting mode.

(3 × 1) (3)

6.3 Operational amplifiers are popular, predictable and an economic system building block.

Give FOUR advantages of operational amplifiers. (4)

[10]

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QUESTION 7

7.1 Illustrate, by means of a simple diagram, the X-Y plotter. (8)

7.2 What is an X-Y plotter? (2)

[10]

QUESTION 8

8.1 Draw up the TRUTH TABLE of the following gates functioning with two inputs:

8.1.1 OR gate

8.1.2 XOR gate

(2 × 4) (8)

8.2 Draw an IEC-symbol of an AND-gate. (2)

[10]

QUESTION 9

9.1 How are flip-flops used in binary counters? (2)

9.2 What is the purpose of shift registers? (2)

9.3 Name the FOUR groups in which shift registers are divided. (4)

9.4 Develop a truth table for the T-type flip-flop. (2)

[10]

QUESTION 10

Convert the following numbers to the base shown in brackets:

10.1 $11{,}011_2$ (10)

10.2 743_8 (10)

10.3 $7{,}625_{10}$ (2)

10.4 $A1C{,}E_{16}$ (2)

10.5 $000101101{,}111_2$ (8)

(5 × 2) **[10]**

TOTAL: 100

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