higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

FAULT FINDING AND PROTECTIVE DEVICES N5

(8080115)

24 November 2023 (X-paper)
09:00–12:00

Drawing instruments may be used.

This question paper consists of 6 pages and a diagram sheet.

086Q1E2324

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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. Start each section on a new page.
5. Use only a black or a blue pen.
6. Write neatly and legibly.

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QUESTION 1

Design and draw only the control circuit of a three-phase sequence starter using the following information.

Press start button, Motor A starts, after 10 seconds Motor B starts, after a further 10 seconds, Motor A stops.

TWO timers are set at 10 seconds and uses 220 V. **[10]**

QUESTION 2

2.1 Explain why one cannot start a large direct-current motor without a starter. (5)

2.2 The line voltage of a three-phase alternator is measured. Between the first set of lines, it reads 380 V. Between the other sets, it reads only 220 V.

What is wrong and how would one correct the fault? (5)
[10]

QUESTION 3

3.1 Explain how brushes are replaced on electrical machines. (4)

3.2 Name FOUR types of brushes. (4)

3.3 State TWO reasons for lubricating the bearings in electrical machines. (2)
[10]

QUESTION 4

4.1 Calculate the value of the dynamic breaking resistor needed to cause maximum breaking effort to a 30 kW, 220 V DC motor. (6)

4.2 Explain the importance of using dynamic braking in DC machines. (4)
[10]

QUESTION 5

State the purpose of the following tests conducted on DC machines:

5.1 'Kick' neutral test

5.2 Martindale test

5.3 Polarity test

5.4 Locked rotor test

5.5 Drop test

(5 × 2) **[10]**

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QUESTION 6

6.1 Refer to FIGURE 1 on the DIAGRAM SHEET (attached) and explain what happens in a circuit when a switch is closed. (6)

6.2 What is the function of the diode in the circuit? (2)

6.3 What is the function of the R? (2)
[10]

QUESTION 7

7.1 Draw a diagram of a positive-series voltage regulator. (5)

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

QUESTION 8

8.1 A JK flip-flop is a very useful flip-flop.

State ONE advantage of a JK flip-flop. (1)

8.2 Draw the IEC symbol of the following:

8.2.1 JK flip-flop (3)

8.2.2 D-type flip-flop (3)

8.3 Name any THREE types of shift registers. (3)
[10]

QUESTION 9

9.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (9.1.1–9.1.6) in the ANSWER BOOK.

9.1.1 When all inputs in a(n) … are zero, the output will also be zero.

A OR gate
B NOT gate
C NOR gate
D NAND gate

9.1.2 … truth table combinations are necessary for a three-input circuit input.

A 4
B 12
C 16
D 8

9.1.3 An AND logic gate will produce a high output if …

A all inputs are high.
B at least one input is high.
C all inputs are low.
D at least one input is low.

9.1.4 The … is a basic logic gate with an output that complements the input.

A inverter gate
B NOR gate
C XOR gate
D AND gate

9.1.5 A NAND gate has …

A low inputs and a low output.
B low inputs and a high output.
C high inputs and a high output.
D None of the above.

9.1.6 The … is a logic gate that will have a high output when any one of its inputs is high.

A NOT gate
B NOR gate
C OR gate
D AND gate

(6 × 1) (6)

9.2 Draw the logic circuit for an exclusive OR gate. (4)

[10]

QUESTION 10

Convert the following numbers to the base shown in brackets:

10.1	$01001010,0110_2$	(16)
10.2	$011,11_2$	(8)
10.3	$76,25_{10}$	(2)
10.4	111.01_2	(10)
10.5	$8A,2_{16}$	(2)

(5 × 2) **[10]**

TOTAL: 100

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(8080115)

DIAGRAM SHEET

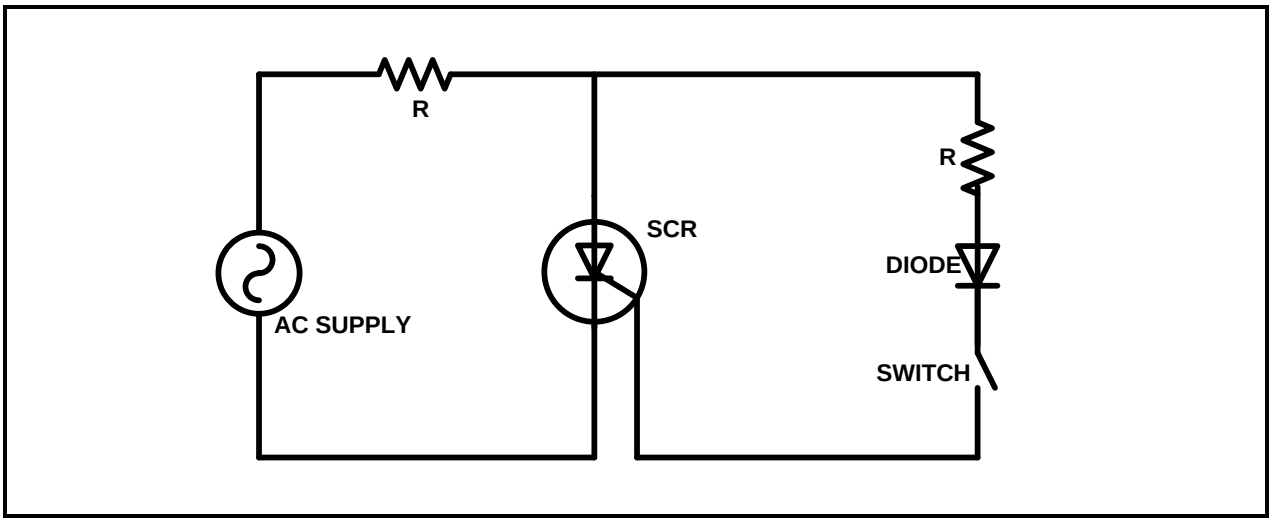


FIGURE 1

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