



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T920(E)(A4)T

NATIONAL CERTIFICATE

LOGIC SYSTEMS N2

(8080262)

**4 April 2018 (X-Paper)
09:00–12:00**

Nonprogrammable calculators may not be used.

This question paper consists of 6 pages.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
LOGIC SYSTEMS N2
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 questions and subsections of questions together.
 5. ALL sketches and diagrams must be large, clear and neat.
 6. Show ALL steps and calculations.
 7. Write neatly and legibly.
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SECTION A**QUESTION 1**

1.1 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 (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 A NOT gate is also known as ...

- A a converter.
- B an inverter.
- C a complemener.
- D both B and C.

1.1.2 Besides a NAND gate, a universal gate is a/an ...

- A AND gate.
- B OR gate.
- C NOR gate.
- D XOR gate.

1.1.3 A group of binary cells:

- A Counter
- B Register
- C Latch
- D Flip-flop

1.1.4 The most basic arithmetic function:

- A Addition
- B Subtraction
- C Multiplication
- D Division

1.1.5 Decimal number 4 in excess-3 code:

- A 110
- B 111
- C 1100
- D 1110

1.1.6 Full-adder forms sum of ...

- A 2 bits.
- B 3 bits.
- C 4 bits.
- D 5 bits.

1.1.7 Flip-flops can be constructed with two ...

- A NAND gates.
- B OR gates.
- C AND gates.
- D NOT gates.

1.1.8 The difference between flip-flops lies in ...

- A their outputs.
- B their inputs.
- C their gates.
- D both A and B.

1.1.9 The state of a flip-flop can be switched by changing ...

- A its input signal.
- B its output signal.
- C its momentary signals.
- D all signals.

1.1.10 Logic gates take input signals and generate signals ...

- A within gates.
- B to input.
- C to output.
- D both A and B.

(10 × 1) (10)

1.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

1.2.1 A T-type flip-flop is constructed by connecting an inverter between the set and the clock terminals.

1.2.2 ROMs are volatile.

1.2.3 An output of an exclusive OR (XOR) gate is 1 only when the inputs are different.

1.2.4 Bidirectional shift registers can shift data either right or left.

1.2.5 A ripple counter is a synchronous counter.

(5 × 1) (5)
[15]

TOTAL SECTION A: 15

SECTION B**QUESTION 2**

- 2.1 List FOUR binary subtraction rules. (4)
- 2.2 Convert the following binary numbers to their equivalent decimal numbers:
- 2.2.1 111000_2
- 2.2.2 110011_2 (2 × 3) (6)
- 2.3 Convert the following decimal numbers to their equivalent binary numbers:
- 2.3.1 27_{10}
- 2.3.2 83_{10} (2 × 3) (6)
- 2.4 Convert each of the following decimal numbers to their binary equivalents and then complete the calculations in the binary number system:
- $120_{10} \div 15_{10}$ (4)
- 2.5 Explain 2421 BCD code. (3)
- 2.6 Decode the XS3 number 101110101000 to its decimal equivalent. (4)
- 2.7 Draw a complete, labelled diagram of a full-adder made of NAND gates. Clearly show ALL inputs and outputs. (8)
- [35]**

QUESTION 3

- 3.1 X and Y are two switches connected in parallel and this combination is then connected in series with the load LED and source battery. When both switches are open, the current does not flow to LED, but when any switch is closed, the current flows.
- 3.1.1 What type of gate is defined by this description? (2)
- 3.1.2 Draw the truth table and the IEC symbol for the circuit. (6)

3.2 Study FIGURE 1 and answer the questions:

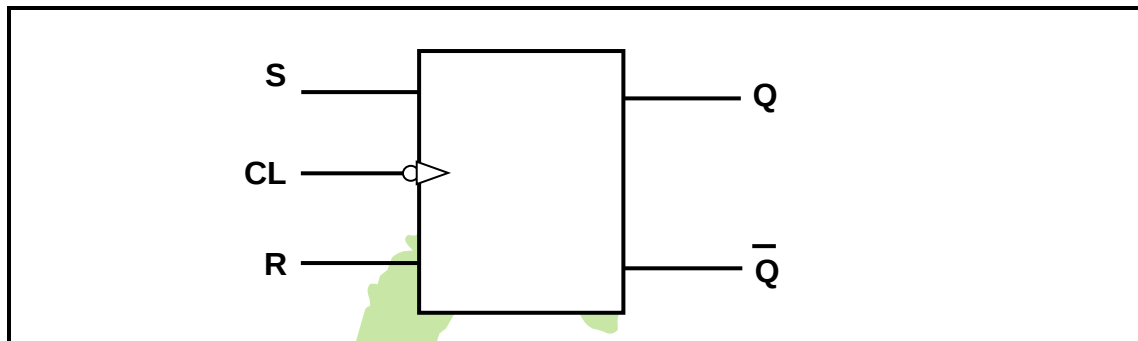


FIGURE 1

3.2.1 Which type of flip-flop is represented in FIGURE 1? (2)

3.2.2 Draw the truth table for the flip-flop in QUESTION 3.2.1. (3)

3.2.3 Draw the logic circuit for the IEC symbol in FIGURE 1. (10)

3.3 Name the IEC symbol shown in FIGURE 2.

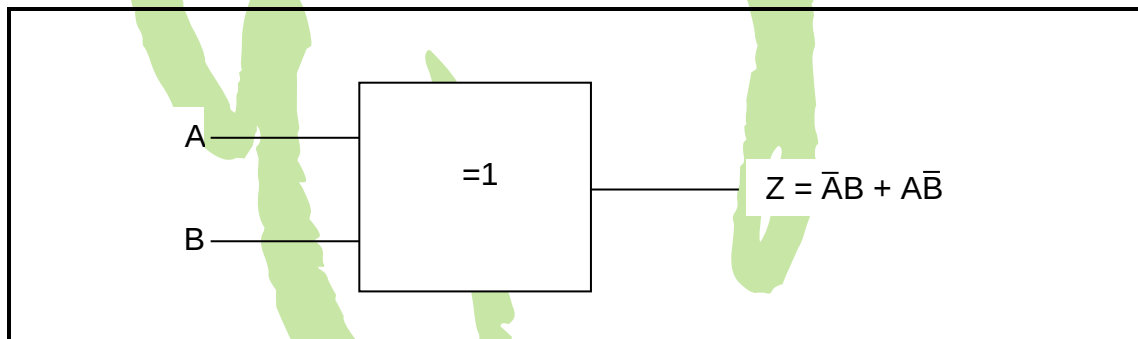


FIGURE 2

(2)
[25]

QUESTION 4

4.1 Draw a fully labelled circuit diagram of a left-shift register using D-type flip-flops with the following features: parallel input, series. (9)

4.2 Draw the truth table of a four-bit decade up-counter. (5)

4.3 Draw a fully labelled circuit diagram of a right-shift register using D-type flip-flops with the following features: series input, parallel output and series output. (7)

4.4 Differentiate between a *series-in series-out shift register* and a *series-in parallel-out shift register*. (2 + 2) (4)
[25]

TOTAL SECTION B: 85
GRAND TOTAL: 100