higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

LOGIC STYSTEMS N2

(8080262)

9 April 2021 (X-paper)
09:00–12:00

Calculators may not be used.

This question paper consists of 5 pages.

110Q1A2109

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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. All the sketches and diagrams must be large, clear and neat.
5. Start each question on a new page.
6. Keep questions and subsections of questions together.
7. Questions must be answered using a blue or black pen and all drawings must be made in pencil.
8. All calculations must be shown.
9. Write neatly and legibly.

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QUESTION 1

1.1 To which radix do the decimal number systems belong? (1)

1.2 How many different combinations can be indicated with four bits? (1)

1.3 Convert the following decimal numbers to their binary equivalent, perform the functions as indicated and then convert the binary answer to its decimal equivalent.

1.3.1 45 + 66

1.3.2 56 – 23

1.3.3 36 ÷ 4

1.3.4 7 × 15

(4 × 5) (20)

1.4 You are given the following truth table. Show by means of a logic circuit that consists of an AND gate and an exclusive OR gate how the truth table could be satisfied.

A	B	Sum	C_o
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

(3)
[25]

QUESTION 2

2.1 Convert the following numbers as indicated:

2.1.1 100101101011 XS3 to its decimal equivalent

2.1.2 376 decimal to its $\overline{8421}$ BCD code

2.1.3 1101 1100 0011 2421BCD code to its decimal equivalent

(3 × 3) (9)

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

2.3 What is meant by a *weighted code*? (2)

2.4 Draw a truth table indicating the conversion of BCD (8421) to XS3 code. (10)
[25]

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QUESTION 3

3.1 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 (3.1.1–3.1.7) in the ANSWER BOOK.

3.1.1 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

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

A 4
B 12
C 16
D 8

3.1.3 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.

3.1.4 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

3.1.5 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.

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

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

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3.1.7 A master / slave JK flip-flop has …. gates in total.

A 8
B 4
C 9
D 10

(7 × 1) (7)

3.2 Give FIVE examples of non-volatile memories. (5)

3.3 Draw the IEC symbols of the following:

3.3.1 JK flip-flop

3.3.2 D-type flip-flop

(2 × 3) (6)

3.4 Draw the logic circuit for the flip-flop in QUESTION 3.3.1 above. (6)

3.5 Jk flip-flop is a very useful flip-flop.

State ONE advantage of a JK flip-flop. (1)
[25]

QUESTION 4

4.1 How many logic gates are used to construct a decoder? (2)

4.2 Why are asynchronous counters also called series counters? (2)

4.3 Provide SIX applications of a shift register. (6)

4.4 Draw a neat, labelled diagram of a 4-bit parallel-in series-out shift register which uses D-type flip-flops. Also include the input control. (10)

4.5 Draw a truth table for a decade counter. (5)
[25]

TOTAL: 100

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