higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T790**(E)**(N17)T

NOVEMBER EXAMINATION

NATIONAL CERTIFICATE

LOGIC SYSTEMS N2

(8080262)

17 November 2016 (X-Paper)
09:00–12:00

This question paper consists of 6 pages.

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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 before answering them.
3. ALL the sketches and diagrams must be large, clear and neat.
4. Keep questions and subsections of questions together.
5. Answers must be clearly numbered according to the numbering on the question paper.
6. Show ALL the steps and calculations.
7. Write neatly and legibly

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QUESTION 1

1.1 Complete the following table in your ANSWER BOOK using binary subtraction rules:

Operation	Results	Borrow
1 – 1	0	**1.1.1**
0 – 0	0	0
1 – 0	**1.1.2**	**1.1.3**
0 – 1	**1.1.4**	**1.1.5**

(5)

1.2 Calculate the following numbers in the BINARY number system and convert the final answer to the DECIMAL number system:

1.2.1

```
    1   1   1   0   1
  - 1   0   0   1   1
  ___________________
  ___________________
```

1.2.2

```
        1   1   0   1
    X   0   0   1   1
  ___________________
  ___________________
```

(2 × 4) (8)

1.3 Divide 60_{10} by 15_{10} using the BINARY number system. (5)

1.4 Draw a logic circuit diagram for a FULL ADDER using the following logic gates:

- two AND gates;
- two XOR gates; and
- an OR gate.

(7)

[25]

QUESTION 2

2.1 Convert 841 decimal to EX3 binary equivalent. (3)

2.2 By definition, what is the difference between an encoder and a decoder? (4)

2.3 Complete the table below in your ANSWER BOOK:

7421 BCD code		**Decimal equivalent**
MSD	LSD	
2.3.1	0100	54
1000	0110	**2.3.2**
1000	**2.3.3**	81
2.3.4	0010	92
0011	**2.3.5**	30

(5)

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2.4 What does the acronym LSD on the above table stand for? (1)

2.5 Draw a neat, labelled logic circuit for a 2421 BCD decoder. (12)
[25]

QUESTION 3

3.1 Various options are provided 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 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

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

A INVERTER gate
B comparator
C OR gate
D AND gate

3.1.3 … truth table entries are necessary for a four-input circuit.

A 4
B 12
C 16
D 8

3.1.4 The … is a logic gate that will have HIGH or '1' at its output when any one of its inputs is HIGH.

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

3.1.5 When one or more inputs in a(n) … are zero, the output will be LOW for any case.

A OR gate
B NOT gate
C AND gate
D NAND gate

3.1.6 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.

3.1.7 If a signal passing through a gate is inhibited by sending a LOW into one of the inputs and the output is HIGH, it is a(n) … gate.

A AND
B NOR
C OR
D NAND

(7 × 1) (7)

3.2 Draw the truth table for a THREE input NAND gate. (4)

3.3

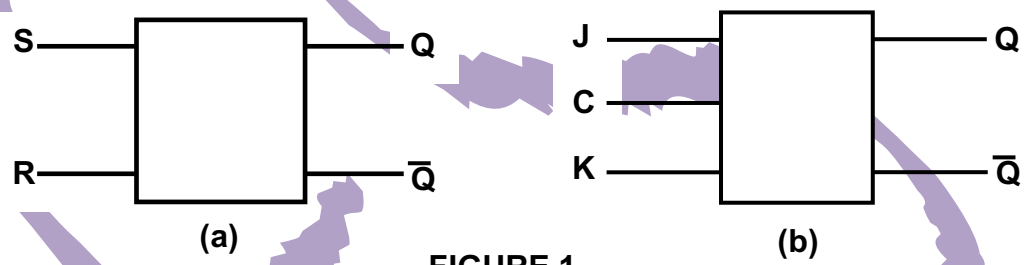

FIGURE 1

3.3.1 Identify the IEC symbols presented in FIGURE 1 above. (2)

3.3.2 Draw the logic circuit for the IEC symbol in FIGURE 1(b) above. (6)

3.4 What does the acronym USB stand for? (2)

3.5 Give FOUR examples of non-volatile memories. (4)
[25]

QUESTION 4

4.1 Briefly explain the difference between:

4.1.1 A 4-bit PIPO (parallel-in/parallel-out) shift register (2)

4.1.2 A 4-bit SIPO (serial-in/parallel-out) shift register (2)

4.2 Many students confuse shift registers with counters.

Explain to them what the main difference between the two is. (4)

4.3 Draw a diagram of a 4-bit asynchronous decade up counter, consisting of JK flip-flops. (9)

4.4 Draw a serial-in serial-out shift register consisting of four D-type master slave flip-flops. (8)

[25]

TOTAL: 100

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