



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

**T870(E)(N11)T
NOVEMBER EXAMINATION**

NATIONAL CERTIFICATE

LOGIC SYSTEMS N4

(8080284)

**11 November 2014 (Y-Paper)
13:00–16:00**

Calculators may not be used.

This question paper consists of 5 pages.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
LOGIC SYSTEMS N4
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. Rough calculations may be done at the back of the ANSWER BOOK.
 6. Write neatly and legibly.
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QUESTION 1

- 1.1 Provide an alternate name for the AIKEN code. (1)
- 1.2 Give the biggest symbol of the BINARY number system. (1)
- 1.3 List the DATA positions which are checked by each parity bit in a SEVEN bit Hamming code word. (3)
- 1.4 Give the name of a positional code. (1)
- 1.5 Write down the TWO'S compliment of $1010,110_2$ (1)
- 1.6 Give the symbol, truth table and Boole expression for a THREE input NOR gate. (3)
- 1.7 State which of the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.7.1–1.7.5) in the ANSWER BOOK.
- 1.7.1 The JK master-slave flip flop will toggle when both J and K are at binary 1.
- 1.7.2 The MONOSTABLE multi-vibrator can be used as a clock pulse generator.
- 1.7.3 The JK master-slave flip-flop triggers on the trailing edge.
- 1.7.4 The EXCLUSIVE or gate functions as an inequality comparator.
- 1.7.5 The BISTABLE multi vibrator is in essence a bipolar RAM cell. (5 × 1) (5)
- 1.8 State FIVE conditions which grouping on a Karnaugh map must comply with. (5)
- 1.9 Name TWO functions of the SCHMITT trigger. (2)
- [22]**

QUESTION 2

2.1 Do the following calculations in the binary system:

$$A, C_{16} - 15, 4_8$$

Make use of the ONE'S compliment method and convert the final answer to the DECIMAL system.

Show ALL conversions and calculations clearly.

(6)

2.2 $E, 3_{16} \div 5, 25_{10}$

Convert the final answer to the OCTAL system.

(6)

2.3 $6, 5_8 \times 4, 75_{10}$

Convert the final answer to the HEXADECIMAL system.

(6)

2.4 Draw a coding table and show ALL the steps for coding 9_{10} for Internet transmission in the Hamming code.

(6)

2.5 Write $76, 9_{10}$ in the following codes:

2.5.1 2421-BKD

2.5.2 Excess -3 BKD

(3 × 2)

(6)

[30]**QUESTION 3**

3.1 Draw the circuit diagram of the Boole expressions below without changing or simplifying it:

3.1.1
$$(A + B)(\overline{A + \overline{B} + C})(B + C) = F$$

3.1.2
$$\overline{\overline{AB} + \overline{ABC} + \overline{BC}} = F$$

3.1.3
$$\overline{(A \oplus B \oplus C)(\overline{A} + B + \overline{C})} = F$$

(3 × 5)

(15)

- 3.2 Simplify the Boole expressions below by using Boolean algebra. Then draw the gate circuit diagrams by using only NAND gates.

3.2.1 $(A + B)\{\overline{A}(\overline{B} + \overline{C})\} + A\overline{B} + \overline{A}C = F$

3.2.2
$$\overline{\overline{(AB + \overline{A}BC)}(\overline{ABC} + \overline{A}BC)(AB + \overline{A}BC)} = F$$

(2 × 5)

(10)
[25]**QUESTION 4**

Design a code converter which will convert the GRAY code (A, B, C, D) to the 8421 BCD code (F1, F2, F3, F4).

Use Karnaugh maps and show the conversion to NAND gates. Then draw the circuit diagram using NAND gates only.

[15]

QUESTION 5

Make a neat labeled sketch of An ASTABLE multi vibrator. Use NPN transistors and clearly show the phase relationship of the TWO output pulses to each other.

[8]

TOTAL: 100