higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T810**(E)**(N28)T

NOVEMBER EXAMINATION

NATIONAL CERTIFICATE

LOGIC SYSTEMS N4

(8080284)

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

Calculators may not be used.

This question paper consists of 5 pages.

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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 Is the RAM in your home computer temporary memory or permanent memory? (1)

1.2 Does a microphone give an analogue signal output or a digital signal output? (1)

1.3 What does BCD stand for? (1)

1.4 Name any self-inverting weighted code. (1)

1.5 Give the symbol, truth table and Boolean expression for an equality comparator gate. (3)

1.6 Which code does internal parity checks during data transmission? (1)

1.7 Give the simplest form of each of the Boolean expressions below:

1.7.1 $1 + A + A\overline{B} + AB\overline{C} + AC$

1.7.2 $A + ABC + 0 + B$

(2 × 1) (2)

1.8 Write down the descriptive names for the following multivibrators:

1.8.1 Astable

1.8.2 Bistable

1.8.3 Monostable

(3 × 1) (3)

1.9 Give the TWO main functions of a Schmidtt trigger. (2)

1.10 1.10.1 Convert F,C_{16} to the octal code. Show ALL steps. (3)

1.10.2 Convert $12,125_{10}$ to the hexadecimal code. Show ALL steps. (3)

[21]

QUESTION 2

2.1 Do the calculations below in the binary system. Show ALL conversions and calculations clearly.

2.1.1 $7{,}5_8 - 9{,}125_{10}$

Use the two's complement method and convert the final answer to the octal number system.

2.1.2 $E{,}5_{16} \times 2{,}375_{10}$

Convert the final answer to the hexadecimal number system.

2.1.3 $A{,}C_{16} \div 2{,}3_8$

Convert the final answer to the octal number system.

(3 × 6) (18)

2.2 Use a table and show all the steps to detect and correct a possible error in the following Hamming code word received from the Internet on your cellphone:

$0011101_{Hamming}$ (6)

[24]

QUESTION 3

3.1 Circuit diagrams are needed by technicians doing repairs on circuit boards.

Draw the circuit diagrams of the Boolean expressions below without changing or simplifying them:

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

3.1.2 $\overline{\overline{A}B + \overline{AB\overline{C}} + A(B+C)}$ = F

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

(3 × 5) (15)

3.2 Simplify the expressions below to their simplest forms:

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

3.2.2 AB + $\overline{\overline{A}B\overline{C} + A\overline{B} + \overline{A}C}$ = F

(2 × 5) (10)

[25]

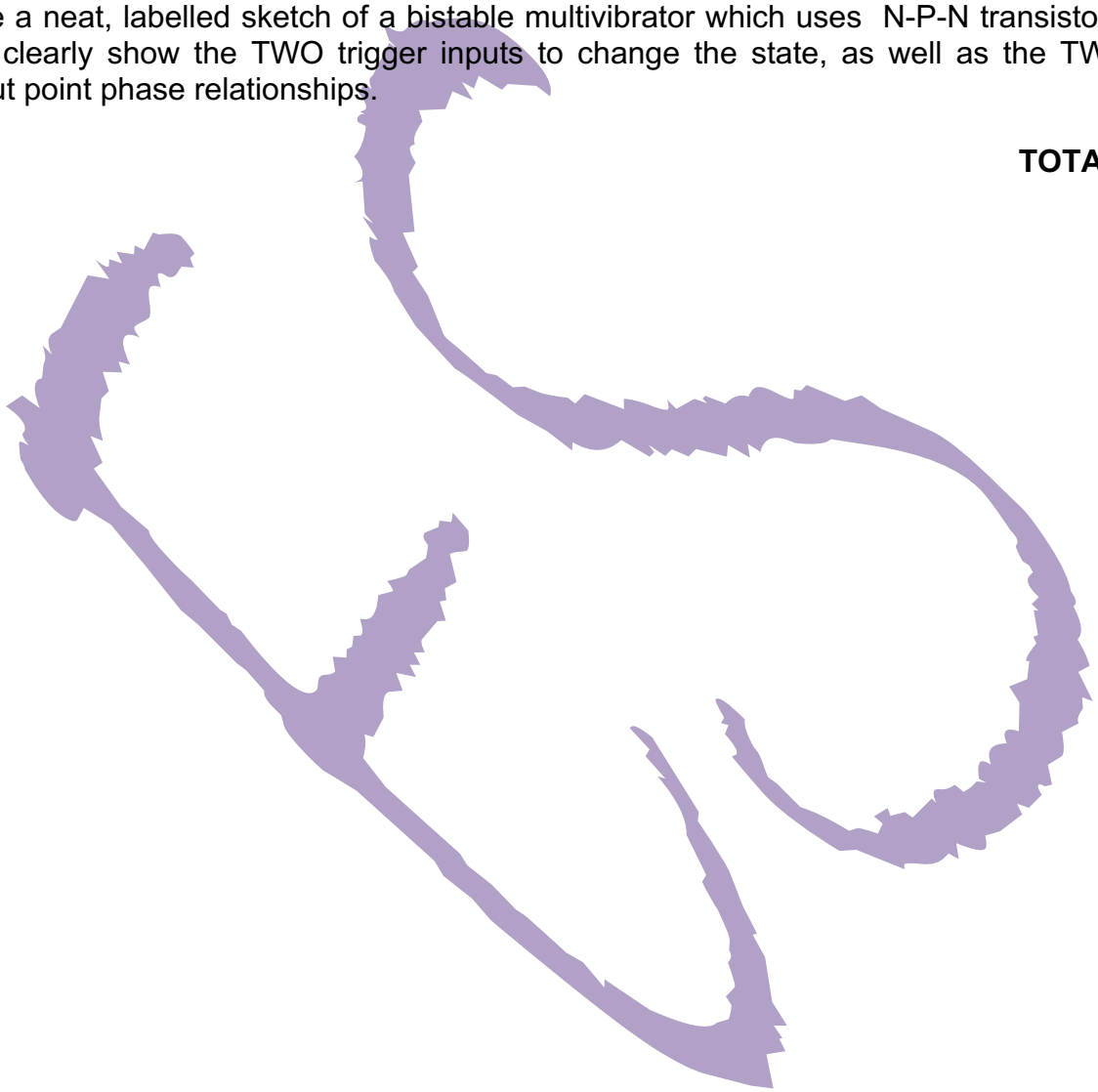
QUESTION 4

Design a code converter for the Telkom undersea cable connection to Australia which will convert the Gray code (A, B, C, D) to the 2421 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. **[20]**

QUESTION 5

Make a neat, labelled sketch of a bistable multivibrator which uses N-P-N transistors. Also clearly show the TWO trigger inputs to change the state, as well as the TWO output point phase relationships. **[10]**

TOTAL: 100



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