



# higher education & training

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL CERTIFICATE DIGITAL ELECTRONICS N5**

(8080365)

**15 April 2021 (X-paper)  
09:00–12:00**

**This question paper consists of 5 pages.**

187Q1A2115

**DEPARTMENT OF HIGHER EDUCATION AND TRAINING**  
**REPUBLIC OF SOUTH AFRICA**  
NATIONAL CERTIFICATE  
DIGITAL ELECTRONICS N5  
TIME: 3 HOURS  
MARKS: 100

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**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 calculations and answers must be given in three fractional radix spaces, for example 10, 011<sub>2</sub>.
  5. Diagrams must be large, neat and labelled and may be done in pencil.
  6. Use only a black or blue pen.
  7. Write neatly and legibly.
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## QUESTION 1

Convert the following numbers to their binary equivalent and complete the calculation in the binary number system. Follow the instructions given in brackets.

- 1.1  $11,2_8 \times 10,125_{10}$  (Convert the answer to hexadecimal.) (6)
- 1.2  $10111,1001_2 - 10100010,0011_2$   
(Use 2's complements. Convert the answer to decimal.) (6)
- 1.3  $121,3_8 \div 24,3_{16}$  (Convert the answer to octal.) (6)

**[18]**

## QUESTION 2

Design, with the aid of a truth table and Karnaugh maps, a circuit that will convert the BCD<sub>(8421)</sub> code with FOUR variables (ABCD) into excess-3. (20)

**[20]**

## QUESTION 3

- 3.1 Draw the integrated circuit of a two-input TTL NAND gate which uses Schottky clamped transistors. (6)
- 3.2 Use NOR gates and a wire-OR connection to represent the function  $AB+CD$ . (3)
- 3.3 Define the following terms with reference to TTL circuits:
- 3.3.1 Noise immunity
- 3.3.2 Propagation delay

(2 × 2)

(4)

**[13]**

## QUESTION 4

- 4.1 Determine the output voltage of a digital-to-analogue converter into which digital code can be fed serially if the input voltage = 1 V, time = 1 m/s,  $R = 100 \Omega$ ,  $C = 100 \mu\text{f}$  and digital code A = 3 672. (3)
- 4.2 Draw a fully labelled circuit diagram of the R/2R ladder digital-to-analogue converter. (5)
- 4.3 Give ONE advantage of the circuit diagram mentioned in QUESTION 4.2. (1)
- 4.4 Give the formula that may be used to determine the output voltage of the circuit mentioned in QUESTION 4.2. (1)

**[10]**