higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T470**(E)**(A6)T

NATIONAL CERTIFICATE

DIGITAL ELECTRONICS N5

(8080365)

6 August 2019 (X-Paper)
09:00–12:00

This question paper consists of 5 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
DIGITAL ELECTRONICS N5
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. Calculation processes and calculated answers must be given in THREE fractional radix spaces, for example 10, 101_2.
5. All sketches must be neat, using a pencil and a ruler and not freehand lines.
6. Use only BLUE or BLACK ink.
7. Keep subsections of questions together.
8. Write neatly and legibly.

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QUESTION 1

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

1.1 $237,7_8 \div A,7_{16}$ (Convert the answer to octal.)

1.2 $37,6_8 \times 10,01_2$ (Convert the answer to hexadecimal.)

1.3 $29,5_{10} - 21,7_8$ (Use 1'complement and convert the answer to decimal.)

(3 × 6) **[18]**

QUESTION 2

Design a synchronous binary counter that can count from 0-9 (0000-1001) that makes use of JK flip-flops and of which the clock is positively triggered.

2.1 Draw the truth table. (11)

2.2 Make use of Karnaugh maps to simplify. (8)

2.3 Draw the circuit diagram. (6)

[25]

QUESTION 3

3.1 Draw the circuit of an open-collector TTL. Clearly label the pull-up resistor on the diagram. (6)

3.2 Name FIVE precautions when handling MOS. (5)

[11]

QUESTION 4

4.1 A digital-to-analogue converter is such that a digital code may be fed into it serially. The following values are related to this D/A converter.

Input voltage = 2,8 V
Time = 1,2 m/s
Resistance = 200 kΩ
Capacitance = 250 µF
Digital code(N) = $1\ 024_{10}$

Draw the circuit and calculate the output voltage. (8)

4.2 Briefly explain the operation of a staircase ramp analogue-to-digital converter. (5)

[13]

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QUESTION 5

5.1 Draw a block diagram of a USART. (10)

5.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (5.2.1–5.2.5) in the ANSWER BOOK.

5.2.1 A UART consists of a receiver, transmitter and CPU.

5.2.2 The receiver converts parallel data to serial data.

5.2.3 The transmitter converts serial data to parallel data.

5.2.4 RAM using bipolar transistor technology is faster than those using MOS technology.

5.2.5 Universal serial bus (USB) is currently the most popular external storage device.

(5 × 1) (5)
[15]

QUESTION 6

6.1 Name THREE input or output devices. (3)

6.2 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 (6.2.1–6.2.5) in the ANSWER BOOK.

6.2.1 The connection from a computer mother board or a peripheral device to another peripheral device is called a/an …

A port.
B baud rate.
C read/write memory.
D access period.

6.2.2 The speed at which data is transferred from a computer to a peripheral device such as a printer is called the …

A baud rate.
B access period.
C address.
D port.

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6.2.3 The time it takes to locate and store (or retrieve) data from a memory location is called the …

A read/write memory.
B address.
C baud rate.
D access period.

6.2.4 Memory that can be read from or written to the central processing unit (CPU):

A Read/write memory
B Address
C Band rate
D Access period

6.2.5 A unique location in a computer memory that contains stored words (in binary):

A Baud rate
B Access period
C Address
D Port

(5 × 1) (5)
[8]

QUESTION 7

Draw a block diagram of a modem. **[10]**

TOTAL: 100

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