higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

DIGITAL ELECTRONICS N5

(8080365)

1 December 2023 (X-paper)
09:00–12:00

Drawing instruments and nonprogrammable calculators may be used.

This question paper consists of 6 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. Use only a black or blue pen.
5. Calculation processes and calculated answers must be given in THREE fractional radix spaces, for example 10, 101.
6. Write neatly and legibly.

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QUESTION 1

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 (1.1–1.6) in the ANSWER BOOK.

1.1 With reference to D/A converters, the minimum and maximum voltage levels that determine a logic state is referred to as …

A resolution.
B linearity.
C fan out.
D threshold.

1.2 The process according to which an output establishes a current path from Vcc to the input of the following gate, is called …

A current sourcing.
B contact bounce.
C leakage current.
D current sinking.

1.3 The connection from a computer mother board or a peripheral device to another peripheral device is called …

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

1.4 The memory device that may be erased by ultra-violet light and then re-programmed, is referred to as …

A RAM.
B EEPROM.
C Mask ROM.
D EPROM.

1.5 Outputs of open collector TTLs may be joined together using a …

A totem-pole configuration.
B pull-up resistor.
C junction capacitor.
D Darlington pair.

1.6 With reference to logic families, propagation delay refers to ...

A elapsing of time between an input change and an output change.
B the maximum number of inputs that can be served by an output.
C the number of output stages that can be connected to a single input.
D the maximum voltage that a TTL circuit can withstand without a false change in output.

(6 × 1) **[6]**

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QUESTION 2

Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–E) next to the question number (2.1–2.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1	A unique location in a computer memory that contains stored words (in binary)	A	access period
2.2	Memory that can be read from or written to the central processing unit (CPU)	B	baud rate
2.3	The time it takes to locate and store (or retrieve) data from a memory location	C	latency
2.4	The speed at which data are transferred from a computer to a peripheral device such as a printer	D	address
2.5	Access to data is delayed by as much as one complete revolution	E	read/write memory
		F	memory capacity

(5 × 1) **[5]**

QUESTION 3

3.1 Convert each of the following numbers to their binary equivalents:
A = $6F,3_{16}$, B = $34,2_8$ and C = $16,75_{10}$ (3)

3.2 Find A × C. The multiplication must be performed in binary, and the answer converted to hexadecimal. (4)

3.3 Find B ÷ C. The division must be performed in binary and the final answer converted to decimal. Consider only the first three bits behind the comma as the final answer. (4)

3.4 Find C - B.

Use 2's complement and convert the answer to octal. (4)
[15]

QUESTION 4

You are requested to design a circuit that will convert the 8.4.2.1 code to Excess-3 BCD. Set up a truth table and use Karnaugh maps for simplifications.

Draw the circuit diagram. **[24]**

QUESTION 5

With reference to TTL NAND gates, answer the following questions:

5.1 Draw the integrated circuit for a two-input TTL NAND gate which uses Schottky-clamped transistors. (6)

5.2 Redraw the truth table below in the ANSWER BOOK and complete the table to show the ON/OFF conditions for the transistors.

A	B	Q_1	Q_2	Q_3	Q_4	F
0	0					1
0	1					1
1	0					1
1	1					0

(4)
[10]

QUESTION 6

ASCII is a code that represents all the characters on a computer keyboard.

6.1 What does the acronym ASCII stands for? (1)

6.2 Decode 1000101, 1011000, 1000001 and 1001101 to ASCII code. (4 × 1) (4)
[5]

QUESTION 7

With reference to computers, answer the following questions:

7.1 Define the term, computer (3)

7.2 Name FIVE main parts of a main-frame computer. (5)
[8]

QUESTION 8

With reference to digital to analog converters answer the following questions:

8.1 What is the purpose of a digital to analog converter? (2)

8.2 Draw the circuit of a D/A converter that has its digital code fed in serial form. (4)
[6]

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QUESTION 9

With reference to computers, answer the following questions:

9.1 Draw a circuit for contact bounce elimination using an SR latch. (4)

9.2 Briefly explain the operation of the circuit in QUESTION 9.1. Start with the switch on the S-input. (2)

[6]

QUESTION 10

10.1 With reference to input and output devices, answer the following questions:

10.1.1 Describe the function of a data bus. (3)

10.1.2 Describe the function of an address bus. (3)

10.1.3 Describe the function of a control bus. (3)

10.2 Differentiate between *impact* and *non-impact printers*. (3 × 2) (6)

[15]

TOTAL: 100

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