higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

DIGITAL ELECTRONICS N5

(8080365)

5 August 2021 (X-paper)
09:00–12:00

Drawing instruments and nonprogrammable calculators may be used.

This question paper consists of 6 pages.

199Q1G2105

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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. Start each section on a new page.
5. Calculation processes and calculated answers must be given in THREE fractional radix spaces, for example 10, 101_2.
6. Use only a black or blue pen.
7. 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 (1.1–1.10) in the ANSWER BOOK.

1.1 Given binary code: 11010_2. The conversion of this code to Gray yields:

A 10110
B 10111
C 11011
D 11001

1.2 The ASCII code for AP is:

A 1000000 1010000
B 1000001 1010001
C 1000001 1010000
D 1000001 1100000

1.3 The output of an EXCLUSIVE-OR gate, if both of the inputs are connected to logic 0, is:

A 1
B 0

1.4 The main advantage of using the R/2R method of D/A conversion over the binary weighted A/D converter is that it …

A has a lower output impedance.
B produces a ramp output.
C requires two resistor values.
D produces a non-inverting signal.

1.5 A type of non-impact printer where characters are burned onto heat-sensitive paper is called a … printer.

A laser
B thermal
C xerographic
D electrostatic

1.6 The device that is used to modulate digital data to audio signals during transmission, and demodulate audio signals to digital data during reception, is referred to as a …

A USART.
B CPU.
C MODEM.
D UART.

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1.7 The BCD number for decimal 149 is …

A 0001 0101 1001
B 0001 0100 1000
C 0001 0101 1000
D 0001 0100 1001

1.8 Static memory devices are best described as:

A Semiconductor memory devices in which stored data will not be retained with the power applied unless constantly refreshed.
B Semiconductor memory devices in which stored data is retained as long as power is applied.
C Memory devices that are magnetic in nature and require constant refreshing.
D Memory devices that are magnetic in nature and do not require constant refreshing.

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

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

1.10 Outputs of open collector TTLs may be joined together using a ...

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

(10 × 1) **[10]**

QUESTION 2

Convert each of the following numbers to their binary equivalents and complete the calculation in the binary number system (follow the instruction in brackets):

2.1 74, 75_{10} × 132, 4_8 (Convert the answer to hexadecimal.) (6)

2.2 3D0, 4_{16} ÷ 11, 6_8 (Convert the answer to octal.) (6)

2.3 122, 75_{10} – 12E, C_{16}

(Use 2's complement and convert the answer to decimal.) (6)

[18]

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QUESTION 3

3.1 Simplify the following function with the aid of Karnaugh maps and draw the circuits using NAND gates only:

F (A,B,C,D) = ∑ m (3; 4; 5; 7; 9; 13; 14; 15) (12)

3.2 Simplify the following function algebraically and draw the circuit using EXCLUSIVE-OR gates only:

F (A,B,C) = ∑ m (1;2;4;7) (6)

[18]

QUESTION 4

4.1 With reference to TTL circuits, answer the following questions:

4.1.1 Briefly indicate the difference in temperature limits between the 5400 and 7400 series. (4)

4.1.2 Name the field of application for the 5400 series. (1)

4.1.3 Briefly indicate the difference in supply voltage limits between the 5400 and 7400 series. (4)

4.1.4 Name the field of application for the 7400 series. (1)

4.2 With reference to the TTL series 7400, 74L00, 74H00, 74S00 and 74LS00, answer the following questions:

4.2.1 Which has the longest propagation delay?

4.2.2 Which has the lowest power dissipation?

(2 × 1) (2)

4.3 With reference to metal oxide semiconductor field effect transistors (MOSFETs), answer the following questions:

4.3.1 Name the TWO types of MOSFETs. (2)

4.3.2 Which of the TWO MOSFETs' gate must be made more positive to enhance conduction between the drain and the source? (1)

4.3.3 What are the components of the C-MOS inverter? (2)

4.3.4 Draw the circuit for the C-MOS inverter. (2)

[19]

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QUESTION 5

With reference to computer memories, answer the following questions:

5.1	Name the TWO basic types of memory that are found in a computer.	(2)
5.2	Give an example of each type.	(2)
5.3	Name the memory in the computer that is non-volatile.	(1)
5.4	Name the THREE major processes involved in memory.	(3)
5.5	What is the main difference between SRAM and DRAM?	(2)
		[10]

QUESTION 6

With reference to analogue-to-digital and digital-to-analogue converters, answer the following questions:

6.1	Give ONE example of each type of converter.	(2)
6.2	Draw the block diagram for a successive approximation ADC.	(8)
6.3	Name ONE good characteristic of the ADC in QUESTION 6.2 above.	(1)
		[11]

QUESTION 7

With reference to interface units, answer the following questions:

7.1	Draw a block diagram showing the format for asynchronous serial data transmission.	(7)
7.2	Define the *baud rate*.	(1)
		[8]

QUESTION 8

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

TOTAL: 100

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