higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T410**(E)**(A7)T

APRIL EXAMINATION

NATIONAL CERTIFICATE

DIGITAL ELECTRONICS N5

(8080365)

7 April 2016 (X-Paper)
09:00–12:00

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. Calculation processes and calculated answers must be given in THREE fractional radix spaces, for example 10, 101_2.
5. Write neatly and legibly.

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QUESTION 1

Various options are provided 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 The output of an AND gate, if one of the inputs is connected to logic 0, is …

A 1
B 0
C Either 1 or 0
D Equal to + 12V

1.2 EEPROM refers to …

A electrically erasable programmable read only memory
B erasable electrostatically programmable read only memory
C electrically erasable programmable random-only memory
D electrostatically erasable programmable random access memory

1.3 The following is an advantage of an open collector output:

A Wired-logic can be performed to connect outputs
B Open collector mode is faster than most technologies
C Memory is erased by inserting a code onto the EPROM pins
D Memory is erased by blowing fusible links

1.4 An advantage of CMOS is that …

A it has low power consumption.
B its speed is higher than TTL.
C it requires less care in handling; it has a low susceptibility to static charges.
D it has low input and output impedances.

1.5 The ASCII code for RL is …

A 1101001 1001100.
B 1010001 1001111.
C 1010010 1001100.
D 1010001 1001000.

1.6 The minimum and maximum voltage levels which determine a logic state, refers to …

A threshold voltage.
B resolution.
C peak inverse voltage.
D linearity voltage.

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1.7 The rate at which data are transmitted is …

A propagation delay.
B speed.
C baud rate.
D fan-out.

1.8 Memories that require refreshing of their charges several times per second, owing to stored charge leakages, are referred to as …

A EEPROM.
B Static RAM.
C Dynamic RAM.
D Mask ROM.

1.9 In an ink-jet printer …

A electrostatic plates deflect charged ink to form characters on a page.
B the toner adheres to magnetised areas, forming characters, when the paper passes through the toner that carries the opposite charge.
C an electric pulse is converted to heat which is applied to special paper, thus forming a character.
D characters are produced electrostatically on a selenium drum.

1.10 Contact bounce may be eliminated using …

A a Darlington Pair.
B Skottkey transistor circuits.
C a replacement switch with copper contacts.
D an SR latch.

(10 × 1) **[10]**

QUESTION 2

If A = $6B, E_{16}$ B = $42, 6_8$ C = $4, 25_{10}$

2.1 Find A – B using 2's complement. The calculation must be performed in binary, and the final answer converted to decimal.

2.2 Find A × C. The multiplication must be performed in binary and the final answer converted to Hexadecimal.

2.3 Find B ÷ C. The division must be performed in binary and the final answer converted to octal.

(3 × 6) **[18]**

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QUESTION 3

Draw the circuit that converts a four variable (P, Q, R, S) Gray code to binary (W,X,Y,Z). Use Karnaugh maps to ensure that your circuit is simplified, such that it consists of the minimum number of gates. **[18]**

QUESTION 4

4.1 Draw the circuit of a TTL NAND function and explain the purpose of the transistor configuration at the output stage. (6)

4.2 Sketch a two input complementary CMOS NAND gate. Show the input and output connections. (6)

4.3 Sketch a dynamic RAM cell. (4)

4.4 What is the difference between dynamic and static RAM? (2)
[18]

QUESTION 5

5.1 The input to a D/A converter is a serial digital code, i.e. N = 2448_{10}.

5.1.1 Draw the circuit. (3)

5.1.2 If the input voltage is 1,5 volts, time (t) = 2 milliseconds, resistance = 300 kΩ, and capacitance = 220 microfarads, then calculate the output voltage. (3)

5.2 Describe the function of a modem. (2)

5.3 Sketch and fully label a functional block diagram of a modem. (10)
[18]

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QUESTION 6

6.1 With reference to the working principles of printers, compare the thermal printer to the inkjet printer. (6)

6.3 With reference to the block diagram of a micro-computer shown in FIGURE 1:

6.3.1 Name A, B and C (3)

6.3.2 Identify the bus connections X, Y and Z, and describe their functions. (9)
[18]

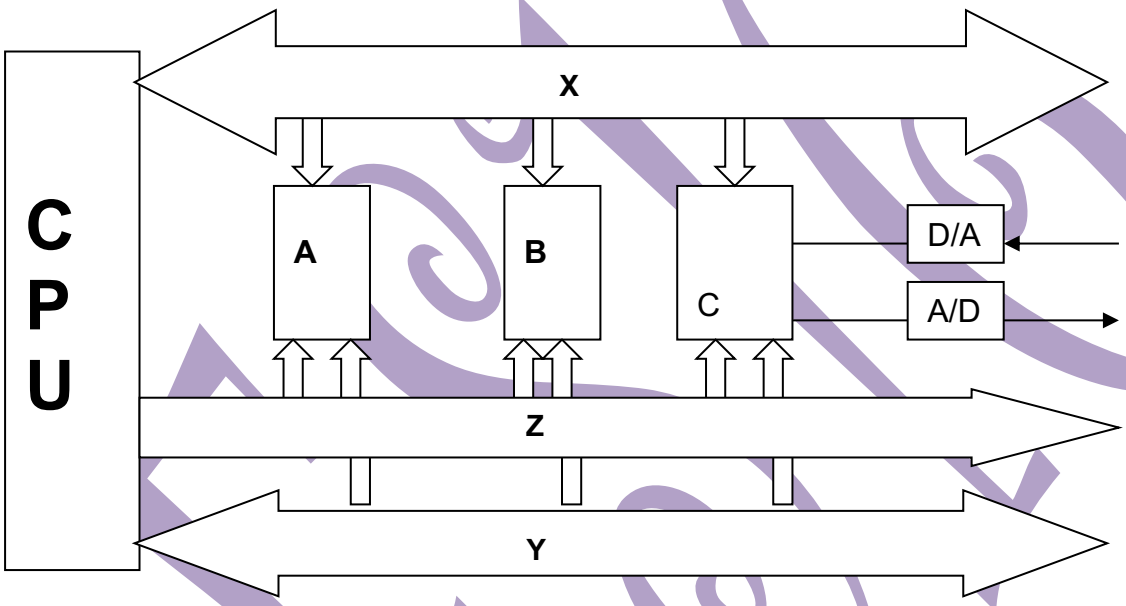


FIGURE 1

TOTAL : 100

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