higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

DIGITAL ELECTRONICS N5

(8080365)

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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. All calculations and answers must be given in three fractional radix spaces, for example 10, 011_2.
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 $BCD_{(8421)}$ code with FOUR variables (ABCD) into excess-3. **[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 ΩK, C = 100 µf 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]

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QUESTION 5

5.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–I) next to the question number (5.1.1–5.1.8) in the ANSWER BOOK.

COLUMN A		COLUMN B	
5.1.1	magnetic core memory	A	data is stored in a flip-flop type of element, and holds a 0 or 1 as long as the ic has power
5.1.2	PROM		
5.1.3	EEPROM	B	ultraviolet light erases memory
5.1.4	EPROM	C	divided into tracks and sectors
5.1.5	static RAM	D	RAM
5.1.6	volatile read/write memory	E	ferrite core is magnetised, storing either a 1 or a 0
5.1.7	drum memories	F	pulses blow fusible links to permanently store data
5.1.8	floppy disk	G	permanently programmed during manufacturing, using the presence or absence of transistors at row-column junctions to effect a 1 or 0
		H	electric pulse erases memory
		I	stores information on parallel tracks on movable metallic cylinders coated with a magnetised surface

(8 × 1) (8)

5.2 Determine the number of address lines needed to select one of the 16 384 words. (4)

5.3 Draw a block diagram of a 1k ROM which can store 256 4-bit words. Use a decoder and encoder that can select in a 32 × 32 memory matrix. (8)

[20]

QUESTION 6

6.1 Name TWO commonly used output peripheral devices. (2)

6.2 Name TWO commonly used input peripheral devices. (2)

6.3 Name TWO examples of impact printers. (2)

6.4 Make a sketch of a C-MOS inverter. (5)

[11]

QUESTION 7

Draw and fully label a functional block diagram of a USART (universal synchronous/asynchronous receiver transmitter. **[8]**

TOTAL: 100

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