higher education & training

Department:
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REPUBLIC OF SOUTH AFRICA

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NATIONAL CERTIFICATE

LOGIC SYSTEMS N5

(8080295)

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This question paper consists of 6 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
LOGIC SYSTEMS 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 circuits must be fully labelled.
5. Waveforms should preferably be drawn with the clock input on top followed by the LSB flip-flop output below the clock input and with the MSB flip-flop output as the last output waveform on the bottom.
6. Write neatly and legibly.

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QUESTION 1

A pump circuit in a factory requires a binary (digital) counter which has the following output state cycle:

001_2, 010_2, 011_2, 100_2, 101_2, and 110_2.

Design a synchronous binary counter that produces the above count cycle:

The counter must be self-starting and must exit from any unused state to the starting state within ONE clock pulse.

Design and draw the circuit making use of a truth table, Karnaugh maps and THREE JK master/slave flip-flops. **[15]**

QUESTION 2

A packaging machine counter needs to generate a binary (digital) output state cycle which is as follows:

110_2, 101_2, 100_2, and 011_2.

Draw the truth table, circuit and the input and output waveforms of an asynchronous binary (digital) counter which uses a gated reset/set to produce the above count cycle.

Use THREE JK master/slave flips in the circuit.

The truth table and waveforms must clearly show the reset action. **[15]**

QUESTION 3

3.1 Name FIVE types of measurement.

3.2 What is the purpose of the time-base divider in a frequency counter?

3.3 A flip-flop that is connected to toggle divides its clock input frequency by two.

Make a fully labelled sketch of a frequency dividing circuit that will convert an input frequency of 800 Hz to 200 Hz.

(3 × 5) **[15]**

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QUESTION 4

Shift registers can store data temporarily and shift the stored data either to the left or to the right.

4.1 Draw a neat, fully labelled circuit diagram of a four-bit parallel-input serial-output (PISO) shift-left register. Show ALL the relevant connections. (9)

4.2 Indicate whether the shift register in QUESTION 4.1 will make use of ASYNCHRONOUS clock connections or SYNCHRONOUS clock connections. (1)

4.3 State the amount of outputs you will have at the output of the shift register in QUESTION 4.1. (1)

4.4 State the amount of inputs you will have at the input of the shift register in QUESTION 4.1. (1)
[12]

QUESTION 5

5.1 The arithmetic logic unit (ALU) is the circuit responsible for the processing of numbers, i.e. adding, subtraction, multiplication and division of numbers.

Draw a fully labelled block diagram of a typical logic multiplier. (8)

5.2 Explain the operation of the logic multiplier in QUESTION 5.1. (6)
[14]

QUESTION 6

6.1 Explain the purpose of internal memory such as SRAM, DRAM and hard disk storage. (5)

6.2 Choose a description from COLUMN B that matches the type of memory in COLUMN A. Write only the letter (A–J) next to the question number (6.2.1–6.2.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
6.2.1	RAM memory	A	utilise semiconductors
6.2.2	SRAM memory	B	stores data in the form of electrostatic charge
6.2.3	DRAM memory	C	has hysteresis effect
6.2.4	ROM memory	D	an early form of computer secondary memory
6.2.5	Magnetic core memory	E	random access memory
6.2.6	DRAM and SRAM memories	F	a rotating disk platter type memory
6.2.7	Magnetic drum memory	G	does not require refreshing circuitry
6.2.8	MOS memory	H	sequential access type memory
6.2.9	Magnetic disk memory	I	used to permanently store fixed data
6.2.10	Magnetic tape memory	J	requires refreshing circuitry

(10 × 1) (10)

[15]

QUESTION 7

Printers are output devices that are used to print documents and graphics from computers onto paper.

Refer to the following list of printers and answer the questions below by writing the answer next to the question number (7.1–7.5) in the ANSWER BOOK.

- Laser printer
- Inkjet printer
- Graph plotter
- Drum printer
- Chain printer
- Thermal printer
- Static printer
- Dot-matrix printer

Name the following printers:

7.1	THREE printers that can print in colour	(3)
7.2	FIVE non-impact printers	(5)
7.3	THREE impact printers	(3)
7.4	The printer with the highest printing speed	(1)
7.5	TWO printers that print variable characters built up as two-dimensional dot matrixes	(2)
		[14]
	TOTAL:	**100**

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