higher education & training

Department:
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REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

LOGIC SYSTEMS N5

(8080295)

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Drawing instruments may be used.

This question paper consists of 6 pages.

215Q1G2106

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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. Label all circuits fully.
5. Draw binary registers with the Most Significant Bit (MSB) flip flop on the left and the Least Significant Bit (LSB) flip flop on the right.
6. Draw waveforms 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.
7. Write neatly and legibly.

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QUESTION 1

A generator safety circuit requires a binary counter which counts as follows:

000_2, 111_2, 001_2, 110_2, 010_2, and 101_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.

NOTE: Design and draw the circuit making use of JK master/slave flip-flops. **[15]**

QUESTION 2

A safety circuit needs to generate a count cycle which is as follows:

2_{10}, 3_{10}, 4_{10}, 5_{10} , 6_{10}, and 7_{10}.

Draw the truth-table, circuit and the input and output waveforms for an asynchronous binary counter which uses gated reset/set to produce the above count cycle.

NOTE: Use JK master/slave flips in the circuit. The truth table and waveforms must clearly show the reset action. **[15]**

QUESTION 3

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

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

NOTE: Label the diagram properly. (5)

3.2 What is the purpose of the time base divider in a frequency counter? (5)

3.3 Name FIVE types of digital measurement. (5)

[15]

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QUESTION 4

Indicate whether the following statements are TRUE or FALSE. Choose the correct answer and write down only 'True' or 'False' next to the question number (4.1–4.15) in the ANSWER BOOK.

4.1 Four left shifts of 0100_2 in a ring counter results in 0010_2.

4.2 Two right shifts of 1000_2 results in 0010_2.

4.3 Two left shifts of 0001_2 results in 0100_2.

4.4 1000_2 and 0001_2 are both Johnson and Ring code numbers.

4.5 A Ring counter and a Johnson counter are one and the same.

4.6 A Johnson counter circulates more than one 1 in each number.

4.7 A Johnson counter is a shift register.

4.8 A parallel-in serial-out shift register converts serial input to parallel output.

4.9 A circulating shift register has its serial output connected to its serial input.

4.10 A circulating shift register has its serial input connected to its serial input.

4.11 Series in series out shift registers are also known as SIPO registers.

4.12 1000_2 is a Johnson Code number.

4.13 A shift of data from LSB to MSB is called right shifting.

4.14 Shift registers are used to count clock pulses.

4.15 Shift registers are used mainly to store and shift data.

(15 × 1) **[15]**

QUESTION 5

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

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

5.2 Explain the operation of the logic multiplier in QUESTION 5.1. (7)

[15]

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	store data in the form of electrostatic charge
6.2.3	DRAM memory	C	hysteresis effect
6.2.4	ROM memory	D	an early form of secondary memory
6.2.5	Magnetic core memory	E	Random Access Memory (RAM)
6.2.6	DRAM and SRAM memory	F	a rotating disk platter type memory
6.2.7	Magnetic drum memory	G	does not require refresh circuitry
6.2.8	MOS memory	H	sequential access memory
6.2.9	Magnetic disk memory	I	used to permanently store fixed data
6.2.10	Magnetic tape memory	J	requires refresh circuitry

(10 × 1) (10)

[15]

QUESTION 7

7.1 Indicate which of the following printers are IMPACT printers or NON-IMPACT printers by writing only 'Impact' or 'Non-impact' next to the question number (7.1.1–7.1.5) in the ANSWER BOOK.

7.1.1 A type of roll (drum) printer

7.1.2 Inkjet printer

7.1.3 Dot matrix printer

7.1.4 'Character at a time' printer

7.1.5 Thermal printer

(5 × 1) (5)

7.2 Indicate whether the following statements are TRUE or FALSE. Write down only 'True' or 'False' next to the question number (7.2.1–7.2.5) in the ANSWER BOOK.

7.2.1 A drum printer uses a laser to print characters.

7.2.2 The dot matrix printer is a character at a time printer.

7.2.3 Plotters are used to print large images onto large sheets of paper.

7.2.4 The thermal printer uses ordinary paper.

7.2.5 Impact printers are generally slow printers.

(5 × 1) (5)
[10]

TOTAL: 100

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