higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T950**(E)**(A1)T

NATIONAL CERTIFICATE

LOGIC SYSTEMS N5

(8080295)

1 August 2018 (X-Paper)
09:00–12:00

This question paper consists of 5 pages.

Copyright reserved

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. Binary registers should be drawn with the Most Significant Bit (MSB) flip flop on the left and the Least Significant Bit (LSB) flip flop on the right.
6. Waveforms should 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.
7. Write neatly and legibly.

Copyright reserved

QUESTION 1

An irrigation control circuit requires a binary counter which counts as follows:

$4_{10,}$ 6_{10}, 7_{10}, 3_{10}, 1_{10}, and 0_{10}.

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 JK master/slave flip-flops. **[15]**

QUESTION 2

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

5_{10}, 6_{10}, 7_{10}, 0_{10} and $1_{10.}$

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.

Use JK master/slave flips in the circuit.

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

QUESTION 3

3.1 Give a brief description of the measurement of total clock pulses.

3.2 Give a brief description of the measurement of frequency.

3.3 Give a brief description of the measurement of time.

(3 × 5) **[15]**

Copyright reserved

QUESTION 4

T	8	4	2	1
0	0	0	0	1
1	0	0	1	0
2	0	1	0	0
3	1	0	0	0
4	0	0	0	1
5	0	0	1	0
6	0	1	0	0

FIGURE 4.1

T	8	4	2	1
0	1	1	1	1
1	0	1	1	1
2	0	0	1	1
3	0	0	0	1
4	0	0	0	0
5	1	0	0	0
6	1	1	0	0

FIGURE 4.2

T	8	4	2	1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	1
3	0	1	1	1
4	1	1	1	1
5	1	1	1	0
6	1	1	0	0

FIGURE 4.3

T	8	4	2	1
0	0	0	0	1
1	0	0	1	0
2	0	1	0	0
3	1	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0

FIGURE 4.4

T	8	4	2	1
0	1	0	0	0
1	0	1	0	0
2	0	0	1	0
3	0	0	0	1
4	1	0	0	0
5	0	1	0	0
6	0	0	1	0

FIGURE 4.5

4.1 Identify the circuit which generates the truth table in FIGURE 4.1. (1)

4.2 Identify the circuit which generates the truth table in FIGURE 4.2. (1)

4.3 Identify the circuit which generates the truth table in FIGURE 4.3. (1)

4.4 Identify the circuit which generates the truth table in FIGURE 4.4. (1)

4.5 Identify the circuit which generates the truth table in FIGURE 4.5. (1)

4.6 What will the number be at clock pulse 9 in the truth table represented by FIGURE 4.2? (1)

4.7 Draw the waveforms for the truth able represented in FIGURE 4.3. (4)
[**10**]

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 above. (7)
[15]

QUESTION 6

Computer memory is required to store the program instruction words and the data words. Each 1 or 0 in each program word or data word is stored in several memory cells for each word.

6.1 Define the term *volatile memory*. (2)

6.2 Define the term *Static Read and Write* (SRAM) memory. (2)

6.3 Define the term *Dynamic Read and Write* (DRAM) memory. (2)

6.4 Define the term *nonvolatile* (NVM) memory and give TWO examples of NVM. (4)

6.5 Draw a fully labelled diagram of a typical SRAM memory cell. (5)
[15]

Copyright reserved

QUESTION 7

7.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (7.1.1–7.1.6) in the ANSWER BOOK.

7.1.1 A drum printer uses a laser to print characters.

7.1.2 The thermal printer uses ordinary paper.

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

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

7.1.5 Impact type printers are generally slow printers.

7.1.6 A thermal printer prints its characters as a matrix of dots.

(6 × 1) (6)

7.2 Indicate which of the following printers are impact printers or non-impact printers. Write down only 'impact' or 'non-impact' next to the question number (7.2.1–7.2.5) in the ANSWER BOOK.

7.2.1 Thermal printer

7.2.2 The type roll (drum) printer

7.2.3 Inkjet printer

7.2.4 The dot matrix printer

7.2.5 The 'character at a time' printer

(5 × 1) (5)

7.3 Explain the similarity between a *dot matrix* and a *thermal type* printer. (2)

7.4 Explain the similarity between a *Drum printer* and a *Chain* (Belt) type printer. (2)

[15]

TOTAL: 100

Copyright reserved