higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

LOGIC SYSTEMS N5

(8080295)

19 November 2020 (X-paper)
09:00–12:00

This question paper consists of 7 pages.

157Q1E2019

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.
7. Write neatly and legibly.

Copyright reserved

QUESTION 1

A conveyer belt control circuit requires a binary counter that counts as follows:

0_{10}, 1_{10}, 3_{10}, 7_{10}, 6_{10}, and 4_{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 that 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 that 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 Convert a 400 Mhz frequency clock pulse series to a 50 Mhz clock pulse series.

Draw a fully labelled suitable circuit that uses JK master/slave flip-flops that will achieve this. Indicate on the circuit the input frequency, all the output frequencies and all the logic levels at all the flip-flop control inputs. (5)

3.2 Calculate (or motivate) the number of JK flip-flops you have in QUESTION 3.1. (5)

[10]

Copyright reserved

QUESTION 4

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (4.1–4.15) in the ANSWER BOOK.

4.1 Shift registers are used mainly to store data permanently.

4.2 Shift registers are used to count clock pulses.

4.3 A shift of data from LSB to MSB is called left shifting

4.4 1000_2 is a Johnson Code number.

4.5 Serial-in, serial-out shift registers are also known as S.I.S.O registers.

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

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

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

4.9 A Johnson counter is a counter.

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

4.11 A ring counter and a Johnson counter are one and the same.

4.12 1000_2 and 0001_2 are both Johnson and Ring code numbers.

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

4.14 Three right shifts of 1000_2 results in 0010_2.

4.15 Three left shifts of 0100_2 in a Ring counter results in 0010_2.

(15 × 1) **[15]**

Copyright reserved

QUESTION 5

5.1

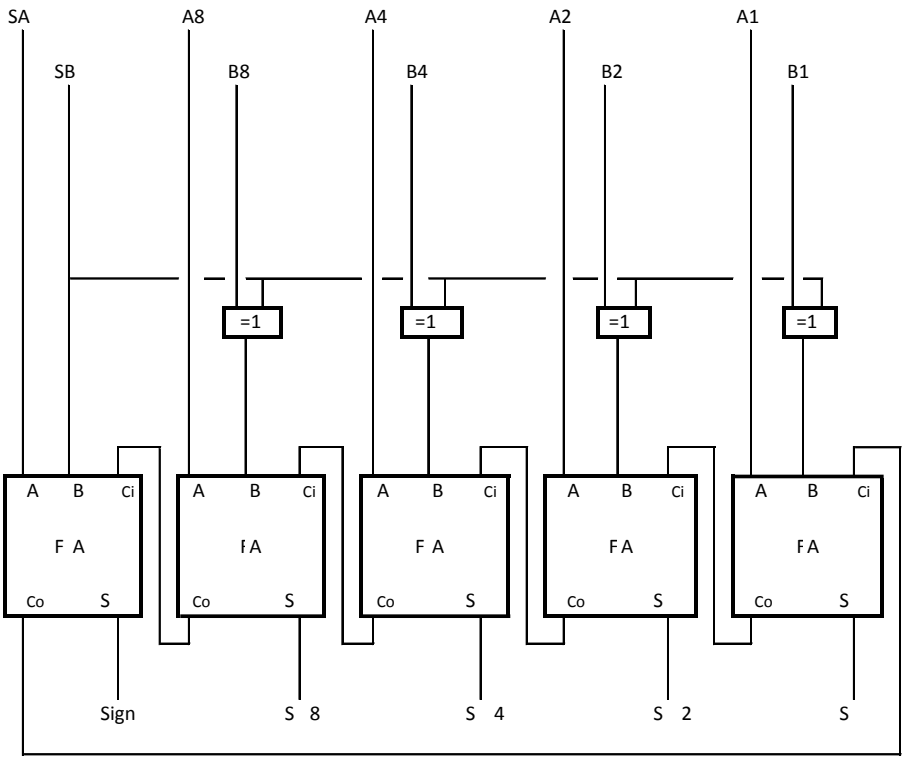


FIGURE 1

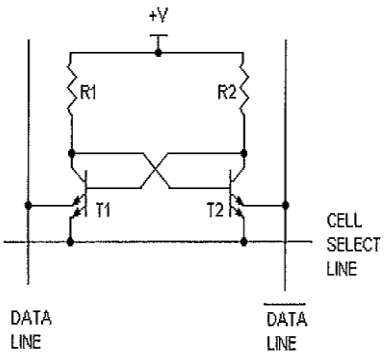
Briefly explain the purpose of an Arithmetic Logic Unit (ALU). (2)

5.2 Name the circuit represented by FIGURE 1 above. (2)

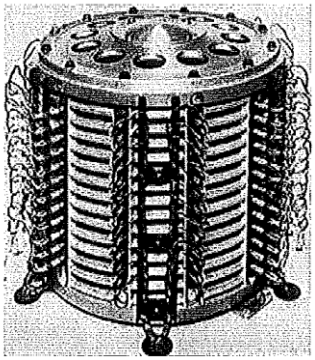
5.3 Redraw FIGURE 1 in the ANSWER BOOK and show clearly on the circuit how 9–3 is performed. (11)

[15]

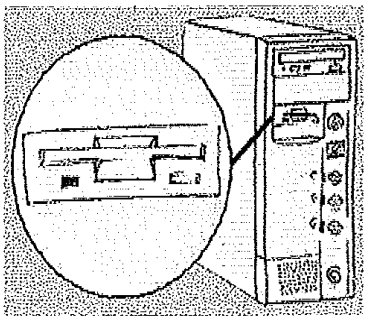
QUESTION 6



A



B



C

FIGURE 2

6.1 Refer to the memory devices in FIGURE 2 above and write down the correct answers to the following questions next to the question numbers (6.1.1–6.1.3) in the ANSWER BOOK.

6.1.1 Name the device in FIGURE 2A.

6.1.2 Name the device in FIGURE 2B.

6.1.3 Name the device in FIGURE 2C.

(3 × 1) (3)

6.2 Refer to the three memory devices in FIGURE 2 above and write down the correct answers (A, B, C or NONE) to the following questions next to the question numbers (6.2.1–6.2.9) in the ANSWER BOOK.

6.2.1 Which of the devices are static cells? (1)

6.2.2 Which of the devices are dynamic cells? (1)

6.2.3 Which of the devices are volatile? (1)

6.2.4 Which of the devices use magnetism? (2)

6.2.5 Which of the devices is an internal memory device? (1)

6.2.6 Which of the devices are external secondary memory? (2)

6.2.7 Which of the devices have transportable storage media? (1)

6.2.8 Which device would have the largest storage capacity? (1)

6.2.9 Which devices are no longer used in computers? (2)

[15]

QUESTION 7

Printers are output devices that convert soft copy into hardcopy.

Refer to the following printer types (A–H) below and write down the correct answers (A–H or NONE) to the questions (7.1–7.6) next to the question numbers (7.1–7.6) in the ANSWER BOOK.

A. Static printer
B. Inkjet printer
C. Graph plotter
D. Chain printer
E. Thermal printer
F. Dot matrix printer
G. Laser printer
H. Drum printer

Copyright reserved

Identify the following printers:

7.1	TWO printers that print pre-formed characters	(2)
7.2	THREE impact printers	(3)
7.3	FIVE non-impact printers	(5)
7.4	THREE printers that can print in colour	(3)
7.54	The printer that can print on the largest paper size	(1)
7.6	The printer with the highest printing speed	(1)
		[15]

TOTAL: 100

Copyright reserved