higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

LOGIC SYSTEMS N2

(8080262)

6 April 2020 (X-paper)
09:00–12:00

Calculators may not be used.

This question paper consists of 6 pages.

110Q1A2006

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
LOGIC SYSTEMS N2
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. Keep questions and subsections of questions together.
5. Questions must be answered with a black or blue pen and drawings must be done in pencil.
6. All the sketches and diagrams must be large, clear and neat.
7. All calculations must be shown.
8. Write neatly and legibly.

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QUESTION 1

1.1 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–J) next to the question number (1.1.1–1.1.6) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.1.1	A logic gate which will have an output 1 when one or all inputs are at logic 1	A	exclusive OR gate
		B	non-volatile memories
1.1.2	Memories that retain information only when power is supplied to the device	C	OR gate
		D	shift register
1.1.3	It is a memory in which information is moved or shifted one position at a time in response to an applied clock pulse	E	volatile memories
		F	RS flip-flop
		G	NAND gate
1.1.4	A logic gate which will have an output 1 when only one of the inputs is at logic 1	H	D-type flip-flop
		I	logic gate
1.1.5	A flip-flop that will delay the flow through of data with one clock pulse	J	truth table
1.1.6	An electronic circuit which will give an output signal by means of a fixed combination of one or more input signals		

(6 × 1) (6)

1.2 Given: X = 17_{10}; Y = 23_{10} and Z = 9_{10}

Convert the given numbers to the binary number system and then perform the arithmetic calculations as instructed. Convert your answers to the decimal number system. Show all the steps in all your calculations. (3)

1.2.1 What is the binary sum of X and Y? (3)

1.2.2 What is the binary difference of Z from Y? (3)

1.2.3 What is the binary product of X and Z? (3)

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1.3 Draw a logic circuit diagram for a FULL ADDER using the following logic gates:

- Two AND gates
- Two XOR gates
- One OR gate

(7)
[25]

QUESTION 2

2.1 Complete the following sentences by writing down only the missing word or words. Write only the answer next to the question number (2.1.1–2.1.2) in the ANSWER BOOK.

2.1.1 Encoding of information is done when characters (e.g. numbers and digits) are … by other symbols.

2.1.2 Codes are usually used for … purposes.

(2 × 1) (2)

2.2 Name TWO examples of weighted codes. (2)

2.3 Convert each of the following numbers to the code indicated:

2.3.1 531 decimal to its 7421 BCD code

2.3.2 1010 0101 1000 XS3 to its decimal number

2.3.3 1111001111 2421 BCD code to its decimal equivalent

(3 × 3) (9)

2.4 Give a reason why a base of two is not added when converting a decimal number to a code. (2)

2.5 Draw a neat, labelled logic circuit for an 8421 BCD encoder. (10)
[25]

QUESTION 3

3.1 Explain the effect of the following input signals in relation to the output of a flip-flop when they are active:

3.1.1 Pre-set

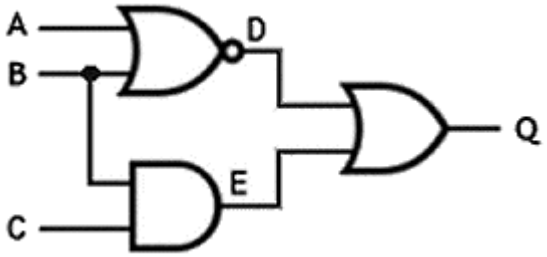
3.1.2 Pre-set/Clear

(2 × 2) (4)

3.2 Draw an IEC symbol for a D-type flip-flop which will include the signals stated in QUESTION 3.1. (4)

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3.3 Study the FIGURE below and answer the questions:



3.3.1 Name the logic gate that will produce the output D. (2)

3.3.2 How many different combinations can be indicated with the given inputs? (1)

3.3.3 Draw the appropriate truth table that is associated with the FIGURE. (9)

3.4 Name FIVE factors to be considered when selecting memories. (5)
[25]

QUESTION 4

4.1 Various options are given as possible answers to the following questions. Choose the answer and write the letter (A–D) (1 mark) with its motivation (2 marks) next to the question number (4.1.1–4.1.5) in the ANSWER BOOK.

4.1.1 In a 4-bit Johnson counter sequence there is a total of … states or bit patterns.

A 1
B 3
C 4
D 8

4.1.2 What type of register would have a complete binary number shifted in one bit at a time and have all the stored bits shifted out one at a time?

A Parallel-in/parallel-out
B Parallel-in/series-out
C Series-in/parallel-out
D Series-in/series-out

4.1.3 In a parallel-in/parallel-out shift register, D0 = 1, D1 = 1, D2 = 1, and D3 = 0. After three clock pulses, the data outputs are …

A 1110
B 0001
C 1100
D 1000

4.1.4 When is it important to use a three-state buffer?

A When two or more outputs are connected to the same input
B When all outputs are normally HIGH
C When all outputs are normally LOW
D When two or more outputs are connected to two or more inputs

4.1.5 What is a recirculating register?

A Serial-out connected to serial-in
B All Q outputs connected together
C A register that can be used over again
D None of the abovementioned

(5 × 3) (15)

4.2 Make a neat, labelled circuit diagram of a four-bit JK up counter. (10)
[25]

TOTAL: 100

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