Diagnostic test CAO wk 1& 2; duration 40 minutes

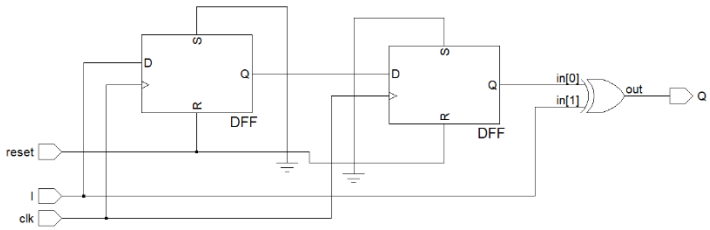
Question 1

$$f(A,B,C,D) = \sum m(8,9,10,12) + \sum_d m(0,2,13)$$

What is the simplified function in sum-of-products?
Note: B' is $\bar{B}$

a□ A.B' + A.C'.D'
b□ A.B' + A.C'
c□ A.C' + B'.D'
d□ none of these

Question 2



What is correct?

a□ It is a Mealy machine and has 4 states
b□ It is an asynchronous sequential system
c□ It is a Moore machine
d□ The right flip-flop always has a setup violation

Question 3

Given is a normalized floating point representation in base 2.
The bit pattern from left to right is:

- Sign bit: 1 bit (1 is negative, 0 is positive),
- Exponent field: 10 bits in excess 15,
- Fraction field: 21 bits (not included is the hidden bit). Point is right of hidden bit.

When the exponent field is filled with all zeros, the representation is not normalized. In that case the decimal number 0 is represented, independent of the sign and fraction field.

What is the bit pattern for exponent field for decimal -9

a□ 0000010010
b□ 0000000011
c□ 0010000000
d□ 0000100011

Question 4

Present state	Next state		Output
	$\bar{X}$	X	Z
S0	S3	S1	0
S1	S2	S2	0
S2	S1	S3	0
S3	S0	S0	1

For the encoding of this state machine two D flip-flops are used (F1, F0) with S0=00, S1=01, S2=10 and S3=11

What is the simplified SOP for data input of flip-flop F1

a□ DF1 = F0'
b□ DF1 = F1'.F0' + F1.F0
c□ DF1 = F1'.F0'.X' + F1.F0'.X + F1'.F0
d□ DF1 = F1'.X' + F1'.F0 + F1.F0'.X

Question 5

Given the FSM as defined in question 4. What is the simplified SOP for the output Z

a□ Z = F1. X
b□ Z = F1.F0
c□ Z = F1.F0.X
d□ Z = F1.F0.X + F1.F0.X'

Question 6

What is the machine code in hex for the ARC instruction:
srl %r1, 10, %r3

a□ A7306A03
b□ 87306A00
c□ 8730600A
d□ 8A30630A

Question 7

```
        .begin
        .org 0
        sethi series,%r1
        srl   %r1,10,%r1
        addcc %r0, 0, %r11
lp:     ld    [%r1], %r10
        addcc %r10,%r0,%r0
        be    rdy
        bneg  nxt
        addcc %r10,%r11,%r11
        nxt: addcc %r1,4,%r1
        ba lp
rdy:    halt
series: 1,2,-3,-4,-2,5,0
        .end
```

What is correct?

a□ The instruction **addcc %r0, 0, %r11** in this program is located in main memory at decimal address 2

b□ After execution the sum of the integer values, with start address labeled *series* and terminated with 0, is stored in %r11

c□ The content of main memory is not changed

d□ none of these

Question 8

The following ARC microprogram is executed. Symbolic names are used in the fields. Before execution the contents of the registers are (decimal values): %r0=0, %temp0=10, %temp1=20 and %temp2=30

address	A	Amux	B	Bmux	C	Cmux	Rd	Wr	ALU	Cond	Jump addr
1108	%r0	0	%r0	0	%temp0	0	0	0	orn	next	10
1109	%temp0	0	%r0	0	%r0	0	0	0	addcc	next	20
1110	%temp0	0	%temp1	0	%temp2	0	0	0	inc	jump	2047

Execution starts at decimal address 1108 and executes the three micro-instructions. Note: decimal values are used in the answers.

What are the correct values after execution?

a□ %r0=0 %temp0=-1 %temp1=20 %temp2=0

b□ %r0=-1 %temp0=-1 %temp1=20 %temp2=0

c□ %r0=0 %temp0=-10 %temp1=20 %temp2=30

d□ %r0=0 %temp0=-1 %temp1=20 %temp2=30

Question 9

Decimal address 1108 is the start of the execution phase in the microstore. What is the bit pattern of field **op3** of the ARC machine code?

What is correct?

a□ 010101

b□ 010100

c□ 100010

d□ The start address of the execution phase is in main memory

Question 10

Important timing properties of a Data flip-flop are: setup time (Tsu), Hold time (Th), and clock to output delay (Tco). What is correct?

a□ For a correct behavior the data at the data input must change between Tsu before until Th after the active edge of the clock.

b□ The output is stable Tco+Th after the active edge of the clock.

c□ A negative time for the hold time is not valid.

d□ none of these

$grade = \max(1 + 9 \times \frac{score - \frac{n}{4}}{n - \frac{n}{4}}, 1)$; ***n*** is number of questions, ***score*** number of correct answers (pass >= 7 correct)