

این تمرین ۱۰۰ امتیاز معادل یک نمره دارد.

تمرینات از کتاب زیر انتخاب شده است.

Morris Mano, and Charles Kime, Tom Martin, **Logic & Computer Design Fundamentals**, 5<sup>th</sup> Edition, Prentice Hall, 2015

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1-

6-18. Represent the following conditional control statement by two register transfer statements with control functions:

If ( $X = 1$ ) then ( $R1 \leftarrow R2$ ) else if ( $Y = 1$ ) then ( $R1 \leftarrow R3 + R4$ )

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2-

6-19. Show the diagram of the hardware that implements the register transfer statement

$C3: R2 \leftarrow R1, R1 \leftarrow R2$

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3-

6-21. Using two 4-bit registers R1 and R2, a 4-bit adder, a 2-to-1 multiplexer, and a 4-to-1 multiplexer, construct a circuit that implements the following operations under the control of the three multiplexer select inputs and the adder's carry-in input:

$R1 + R2$   
 $R1 - R2$   
 $R2 - R1$   
 $R1 - 1$   
 $-(R1 + 1)$   
 $0$   
 $-1$

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4-

8-7. Design an ALU that performs the following operations:

$A + B$   
ShiftRight A  
 $A + B' + 1$   
 $A \text{ OR } B$   
 $B'$   
ShiftLeft A  
 $B + 1$   
 $A \text{ AND } B$

Give the result of your design as the logic diagram for a single stage of the ALU. Your design should have one carry line to the left and one carry line to the right between stages and three selection bits.

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5-

8-12. A computer has a 32-bit instruction word broken into fields as follows:  
opcode, six bits;

two register file address fields, five bits each;

and one immediate operand/register file address field, 16 bits.

(a) What is the maximum number of operations that can be specified?

(b) How many registers can be addressed?

(c) What is the range of unsigned immediate operands that can be provided?

(d) What is the range of signed immediate operands that can be provided, assuming that the operands are in 2s complement representation and that bit 15 is the sign bit?

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6-

8-14. A digital computer has 32-bit instructions. There are a number of different instruction formats, and the number of bits in each format used for opcodes varies depending on the bits needed for other fields. If the first bit of the opcode is 0, then there are three opcode bits. If the first bit of the opcode is 1 and the second bit of the opcode is 0, then there are six opcode bits. If the first bit of the opcode is 1 and the second bit of the opcode is 1, then there are nine opcode bits. How many distinct opcodes are available for this computer?

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7-

A new instruction is to be defined for the BASIC computer.

The instruction compares two unsigned integers stored in register AC and memory.

If the integers are equal, then bit 0 of TR is set to 1. If AC is greater than memory, then bit 1 of TR is set to 1. Otherwise, bits 0 and 1 are both 0. All other bits of TR have value 0. Find the state machine diagram for implementing the instruction, assuming that 000 is the opcode. Form the part of the control state table that implements this instruction.

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موفق باشید