The final covered stuff from the lab

Assembly to Machine Code

Which of the following choices fo

Perform

(AB.2A)16 = (171.1640625 ) 10

(10010.0) 10 = (20) 9

A DIGITAL COMPUTER REPRESENTS ITS FLOATING POINT NUMBERS USING A SIGNED 6-BIT EXPONENT AND A SIGNED NORMALIZED 10-BIT MANTISSA. NEGATIVE EXPONENT AND MANTISSA VALUES ARE EXPRESSED IN 2ND COMPLEMENT. SHOW THE BINARY VALUES OF THE EXPONENT AND MANTISSA TO REPRESNET (21.1)8.

\*\*\* ( COULD BE NEGATIVE )

10-BIT MANTISSA = 010 001 0010

6-BIT EXPONEDNT = 00101

Translate the following machine codes to their equivalent instructions.

CCCC BUN CCC I

1234 ADD 235

dcba BSA CBA I

7002 SZE

a jk FF (A )is used to by a CPU to perform the following micro operations In RTL

1- xT1: A 🡨 0 REST A TO 0

2- y T2: A🡨 1 SET A TO 1

3-zT3 : A 🡨 1 SET A TO 1

Q/ otherwise the content of A remains the same. The signals T1, T2, … ETC, are outputs of a decoder.

1- Draw the logic diagram of the control circuit governing the FF A.

2- the above micro operations are replaced by the following ones:

-xT1 : A🡨 0

-yT2 : A 🡨 1

-zT3 : A 🡨 A’

-wT4: A 🡨 G Transfer external biit G to A

Without excitation tables and k-maps, draw the new logic diagram of the control circuit govering the ff A.

Q/ Using table 6 to translate program 1 in its equivalent machine code by specifying the machine code of each instruction/operand (in hex), and its address in the memory (in hex)

Program 1: Assembly program

|  |  |
| --- | --- |
| ADDRESS IN HEX | CONTENT ON HEX |
| 0000 | 0000 |
| 0017 | 2LabA |
| 0018 | 7004 |
| 0019 | 2101 |
| 001A | 7020 |
| 001B | 3102 |
| 001C | 7001 |

001D 0000

|  |  |
| --- | --- |
| 001E | 000e |
| 001F | 000a |

ORG 0

X, HEX 0

ORG 1 7

Y, LDA A

SZA

LDA B

INC

STA C

HLT

A, 0

B, DEC 14

C, HEX 000A

END

2- After the execution of the program, what is the content ( in hex) of the word with the symbolic address c ? 0001

3-After the execution of the program, what is the content ( in hex ) of the AC ? 0001

4- After the execution of the program, what is the content with the address zero? 0000

Q4/(1) Write an assembly subroutine ( not a service routine ) whose symbolic base address is SRT=200 (HEX) to increment the content of address 161 (HEX ) id the address 160 contains an even number. Do not exceed 12 lines of code.

Sol

ORG 200

SRT, 0

LDA 160

CIR

SZE

BUN EXT

LDA 161

INC

STA 161

EXT, BUN SRT I

(2) This part os independent of part 1.

Assume that 16 operands are stored in the memory starting from address 100 (hex). Write an assembly program to count the number of even operands and store it at address 161 (hex). The program should start at address 50 hex and use the subroutine SRT ( of part 1 ). Don’t exceed 14 lines of coode.

Sol

ORG 0

CLA

STA 161

LOP, LDA PRT I

STA 160

BSA SRT

ISZ PTR

ISZ CTR

BUN LOP

HLT

PTR, 100

CTR, FF0 / DEC -16

Q/ consider the computer of lab 4, the architecture of which is described in figure 1/ and tables 1,2,3,4, and 5. The instruction type is determined by the 2 most sig bits of the 8-bit register IR. As follows...

X0 = (IR (7) IR (6))’ Denotes a memory reference instruction (MRI) in a direct addressing mode.

X 1 = (IR (7))’ IR (6) denotes a register reference instruction (RRI).

X 2 = IR (7) (IR (6))’ denotes a memory reference-instruction (MRI) in indirect addressing mode.

The Flip Flop S is a STOP register which prevents PC from being incremented. If S=1

Assume that all registers are equipped with 3 control bits for loading the register, increment it by 1, and reset it to 0.

1. Find the list of all micro operations that use the bus and group them according to the register to be placed on the bus ( IR, AR, PC, … etc )

2-Draw the logic diagram of the control circuit which governs the bus

3-find the list of all mic operations which change the value of register pc

4- draw the logic diagram of the control circuit of pc.