

Lista Teórica 2

Rafael Amauri Diniz Augusto

Questões 1 a 8

```

① x=10      # a = $50
b=-7        # b = $51
a=a+7      # c = $52
c=a+b      # inicio

.TEXT
.GLOBL MAIN

MAIN:
    ORI $50,10  # A = 10
    ORI $51,0xFFFF
    SLL $51,$50,76 # B = -1
    ORI $57,0xFFFF
    ADD $50,$50,1 # A = A + 1
    ADD $52,$50,$51 # C = A + B
    # FIM

② x=3      # x = $50
y=x+4      # y = $51

# inicio
.TEXT
.GLOBL MAIN

MAIN:
    ORI $50,3  # x = 3
    SLL $51,$50,2 # y = x + 4
    # FIM

```

③ x=3
y = x * 1025

④ x=3
y = x / 4

X = \$50
Y = \$51

inicio
.TEXT
.GLOBL MAIN

MAIN:
ORI \$50,3 # X=3
SLL \$51,\$50 +# Y=3 * 1024
ADD \$51,\$51,\$50 # Y=3 * 1025
FIM

MAIN:
ORI \$50,3 # X=3
SRL \$51,\$50,4 # Y=3
FIM

⑤ x = 305479 \$56 → 0x72345678

x = \$50
⑥ x=-1
y=x/3

inicio
.TEXT
.main

MAIN:
ORI \$50,0x1234
SLL \$50,\$50,76
ORI \$50,0x5578
FIM

MAIN:
ORI \$50,0xFFFF
SLL \$50,\$50,16
ORI \$50,0xFFFF
SRL \$51,\$50,5

⑦ AC[2] = H + A[3]

AC[0] = \$50
H = \$51

inicio
.TEXT

.GLOBAL MAIN

MAIN:
LW \$t0,\$(\$51) # T0 = MEM[E8+\$51]
ADD \$t1,\$50,\$t0 # T1 = H + AC[3]
SW \$t1,T2(\$51) # A[T2] = H + AC[3]
FIM

⑧ H = K + AC[2]

H = \$50
K = \$51
I = \$52
AC[0] = \$53

inicio
.TEXT
.GLOBAL MAIN

MAIN:
SLL \$t0,\$50,2 # T0 = 4
ADD \$t1,\$53,\$t0 # T1 = AC[0 + 4]
LW \$T2,0(\$T1) # T2 = AC[1]
ADD \$50,\$51,\$T2 # H = K + AC[1]

Questões 9 a 13

⑨ $A[>] = H + A[0]$

```

# I = $S0
# J = $S1
# H = $S2
# A[0] = $S3
JEXT
.GLBL MAIN
MAIN:
SLL $T0,$S0,2 # T0 = +1
ADD $T1,$T0,$S3 # A[0+1]
LW $T2,0($T1) # T2 = A[0]
ADD $T3,$S2,$T2 # T3 = H + A[0]
SLL $T0,$S1,1 # T0 = +1
ADD $T1,$T0,$S3 # T1 = A[0+1]
SW $T2,0($T3) # A[1] = H + A[0]

```

⑩ $H = A[1] - A[0+1]$ $A[1+1] = H$

```

# I = $S0   H = $S1   A[0] = $S3
# INICIO
SLL $T0,$S0,2 # T0 = +1
ADD $T1,$T0,$S3 # T1 = A[0+1]
LW $S1,0($T1) # H = A[0]
ADD $T2,$T1,+ # T2 = A[0+1+1]
LW $T3,4($T1) # T3 = A[1]
SW $T3,0($T2) # A[1] = A[1+1]
SW $S1,4($T2) # A[1+1] = H
# FIM

```

⑪ $J = $S0 \quad I = $S1$

```

ADDI $S0,$ZERO,0
ADDI $S1,$ZERO,10
Loop:
ADDI $S0,$S0,7
BNE $S1,$S0,Loop

```

⑫ $\# S0 = A$

```

# INICIO
ORI $T0,$ZERO,0x1001 # T0 = 0x1001
SLL $T0,$T0,16 # T0 = 0x10010000
LW $S0,0($T0) # A = MEM[0]
SRL $T1,$S0,31 # SHIFT DO SIGNAL
BEQ $T1,$ZERO,STORE # SE > 0 GOTO STORE
SUB $S0,$ZERO,$S0 # SE < 0 INverte

```

STORE:

```

SW $S0,0($T0) # MEM[0] = A
# FIM

```

⑬ $\# \$S0 = TEMP$

```

# INICIO
ORI $T0,$ZERO,0x1001 # T0 = 0x1001
SLL $T0,$T0,16 # T0 = 0x10010000
LW $S0,0($T0) # TEMP = MEM[0]
ADDI $T2,$ZERO,1 # T2 = 1
SLT $T1,$S0,$T1 # IF TEMP <= 0, T1 = 1 ELSE T1 = 0
BNE $T1,$ZERO,ME50 # IF TEMP <= 0 GOTO ME50
SW $ZERO,4($T0) # ELSE FLAG = 0
ME50: SLL $T1,$S0,30 # IF TEMP >= 0, T1 = 1 ELSE T1 = 0
BEQ $T1,$ZERO,FLAG # IF TEMP >= 0 GOTO FLAG
SW $ZERO,4($T0) # ELSE FLAG = 0
J FIM # JUMP FIM

```

FLAG: SW \$T2,4(\$T0) # FLAG = 1

FIM:

FIM

Questões 14 a 16

14 # \$S0 = VETOR[0] # \$S1 = 1 # \$S2 = J # \$S3 = TAM-VETOR
 ORI \$T0, \$0, 0x1001
 SLL \$T0, \$T0, 16
 ADD \$S0, \$T0, \$0
 ADDI \$S1, \$0, 0 # I=0
 ADDI \$S2, \$0, 0 # J=0
 ADDI \$S3, \$T0, 5 # TAM-VETOR=5
 ADD \$T5, \$0, 4
 DOT:
 ORI \$T0, \$0, 0x1001 # VETOR[0]=0x1001
 SLL \$T0, \$T0, 16 # VETOR[0]=0x10000000
 ADDI \$S2, \$0, 0 # J=0
 D01:
 LW \$T1, 0(\$T0) # VETOR[E]
 LW \$T2, 4(\$T0) # VETOR[E+1]
 SLT \$T3, \$T2, \$T1
 BNE \$T3, \$0, SWAP
 VOLTA:
 ADDI \$T0, \$T0, 4 # PROX POSIGAO
 ADDI \$S2, \$S2, 1 # I+=
 BNE \$S2, \$TS, D02 # WHILE (J < 5)
 ADDI \$S0, \$S0, 4 # PROX POSIGAO
 ADDI \$S1, \$S1, 1 # I+=
 BNE \$S1, \$S3, D01 # WHILE (J < 5)
 J FIM
 SWAP:
 ADD \$T4, \$0, \$T1
 SW \$T2, 0(\$T0)
 SW \$T4, 4(\$T0)
 J VOLTA
 FIM: # FIM

15 # X = \$S0 # J = \$S1
 MAIN:
 LW \$T0, 0x1001
 LW \$S0, 0(\$T0) # X = MEM[0]
 ANDI \$T1, \$S1, 1
 MULT \$S0, \$S0
 MFLO \$T2 # T2 = X²
 MULT \$S0, \$T2
 MFLO \$T3 # T3 = X³
 MULT \$S0, \$T3
 MFLO \$T4 # T4 = X⁴
 MULT \$S0, \$T4
 MFLO \$T5 # T5 = X⁵
 BEQ \$T1, \$ZERO, PAR
 IMPAR:
 SUB \$S1, \$T5, \$T3 # Y = X⁵ - X³
 ADDI \$S1, \$S1, 1 # Y = X⁵ - X³ + 1
 J FIM
 PAR:
 SLL \$T5, \$T2, 1 # TS = 2X²
 ADD \$S1, \$T4, \$T3 # J = X⁴ + X³
 SUB \$S1, \$S1, \$T5 # J = X⁴ + X³ - 2X²
 FIM:
 # FIM

16 # X = \$S0 # Y = \$S1
 # INICIO
 MAIN:
 LUI \$T0, 0x1001
 LW \$S0, 0(\$T0) # X = MEM[0]
 MULT \$S0, \$S0
 MFLO \$T2 # T2 = X²
 MULT \$S0, \$T2
 MFLO \$T3 # T3 = X³
 MULT \$S0, \$T3
 MFLO \$T4 # T4 = X⁴
 SLT \$T1, \$S0, 1 # SE > 1 T1=1 ELSE T1=0
 BNE \$T1, \$ZERO, MENOR IGUAL
 MAIOR:
 ADDI \$S1, \$T3, 1 # Y = X³ + 1
 SW \$S1, 0(\$T0) # MEM[0] = Y
 MENOR IGUAL:
 SUBI \$S1, \$T4, 1 # Y = X⁴ - 1
 SW \$S1, 0(\$T0) # MEM[0] = Y

Questões 17 a 19

⑦ FIBONACCI
 $\# \$50 = A[0]$ $\$51 = N^{\text{a}} \text{ DE ELEMENTOS}$

MAIN:

```
LUI $50, 0X1001 # MEM[0]
ADDI $T0, $2ZERO, 1 # T0=1
ADDI $51, $2ZERO, 100 # S1=100
SW $T0, $0$50) # MEM[0]=1
SW $T0, 4($50) # MEM[1]=1
DO:
    LW $T1, 0($50) # T1=A[N-1]
    LW $T2, 4($50) # T2=A[N-2]
    ADD $T3, $T2, $T1 # T3=A[N-1]+A[N-2]
    SW $T3, 8($50) # A[0]=T3
    ADDI $50, $50, + # A[0]=+
    ADDI $T0, $T0, 1 # T0=T0+1
    BNE $T0, $51, DO
    #FIM
```

OUPACAO MÁXIMA: 48 POSIÇÕES

⑧ $\# \$50 = N$ $\$51 = \text{FLAG}$

MAIN:

```
LUI $T0, 0X1001 # MEM[0]
LW $50, 0($T0) # N=MEM[0]
ADDI $51, $2ZERO, 0 # FLAG=0
SLTI $T1, $50, 101 # IF N < 100 T1=1 ELSE T1=0
BNE $T1, $ZERO, MENOR100
J FIM1
```

MINOR100:
 $\text{SLT } \$T1, \$T2, \$50, 50 \# \text{IF } N \leq 50 \text{ } T1=1 \text{ ELSE } T2=0$
 $\text{BEQ } \$T2, \$ZERO, MENOR100 \text{ MAIOR50}$
 J FIM1

MAIOR50:
 $\text{ADDI } \$S1, \$2ZERO, 1 \# \text{FLAG}=1$
 J FIM

FIM1:
 $\text{BEQ } \$S1, \$ZERO, CASO2 \# \text{IF FLAG}=0$
 J FIM

CASO2:
 $\text{SLT } \$T1, \$T2, \$50, 201 \# \text{IF } N \leq 100 \text{ } T1=1 \text{ ELSE } T1=0$
 $\text{BNE } \$T1, \$ZERO, MENOR100 \text{ MAIOR150}$
 J FIM

MAIOR150:
 $\text{SLT } \$T1, \$T2, \$50, 150 \# \text{IF } N > 150 \text{ } T2=1$
 $\text{ELSE } T2=0$
 $\text{BEQ } \$T2, \$ZERO, MENOR100 \text{ MAIOR150}$

MINOR100 MAIOR150:
 $\text{ADDI } \$S1, \$2ZERO, 1 \# \text{FLAG}=1$

FIM:

#FIM

⑨ MEDIANA
 $\# \$50 = A$ $\$51 = B$ $\$52 = C$

MAIN:

```
LUI $T0, 0X1001 # A[0]
LW $50, 0($T0) # A=MEM[0]
LW $51, 4($T0) # B=MEM[1]
LW $52, 8($T0) # C=MEM[2]
```

SLT \$T1, \$S1, \$50 # IF B < A T1=1 ELSE T1=0
 $\text{SLT } \$T2, \$50, \$51 \# \text{IF } A < C \text{ } T2=1 \text{ ELSE } T2=0$
 $\text{AND } \$T3, \$T1, \$T2 \# T3=\text{AND}(T1,T2)$
 $\text{BNE } \$T3, \$2ZERO, A\text{MEDIANA}$
 $\text{SLT } \$T1, \$50, \$52 \# \text{IF } A > B \text{ } T1=1 \text{ ELSE } T1=0$
 $\text{SLT } \$T2, \$51, \$52 \# \text{IF } B < C \text{ } T2=1 \text{ ELSE } T2=0$
 $\text{AND } \$T3, \$T1, \$T2 \# T3=\text{AND}(T1,T2)$
 $\text{BNE } \$T3, \$2ZERO, B\text{MEDIANA}$
 $\text{SW } \$52, 12($T0) \# C \text{ É A MEDIANA}$
 J FIM

A MEDIANA:
 $\text{SW } \$50, 12($T0) \# A \text{ É A MEDIANA}$
 J FIM

B MEDIANA:
 $\text{SW } \$50, 12($T0) \# B \text{ É A MEDIANA}$
 J FIM

FIM:

#FIM

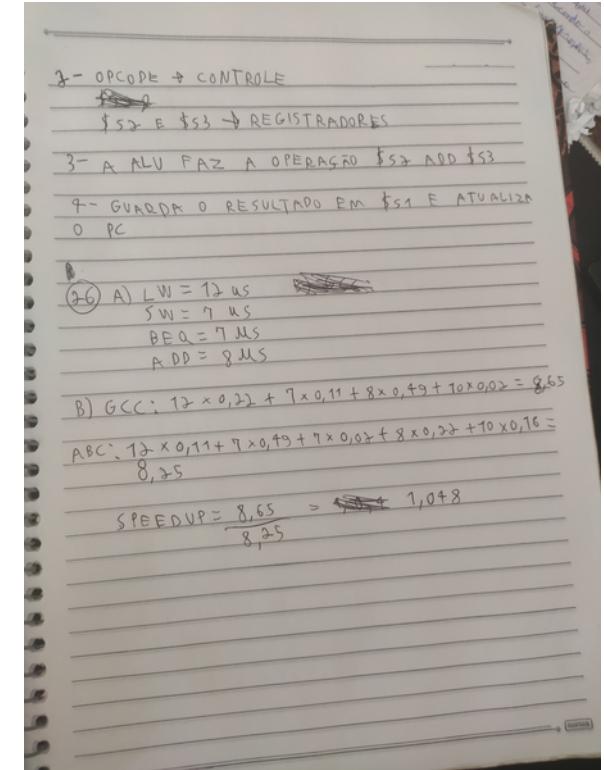
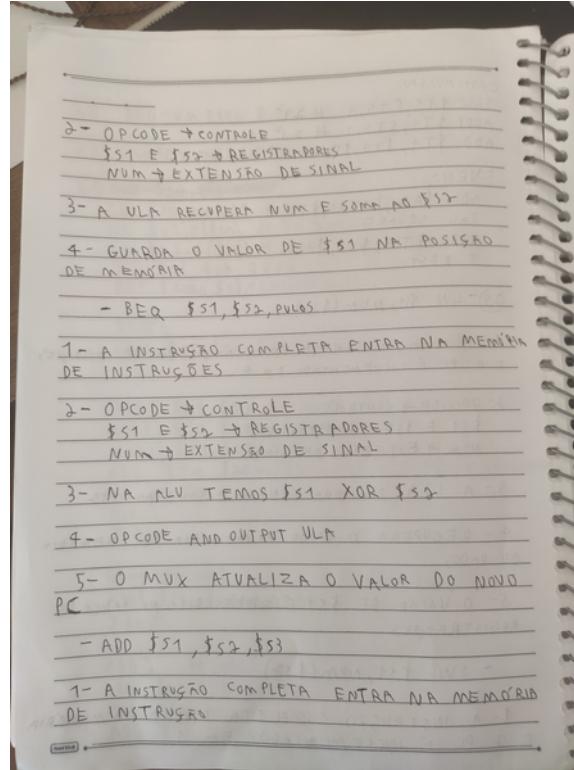
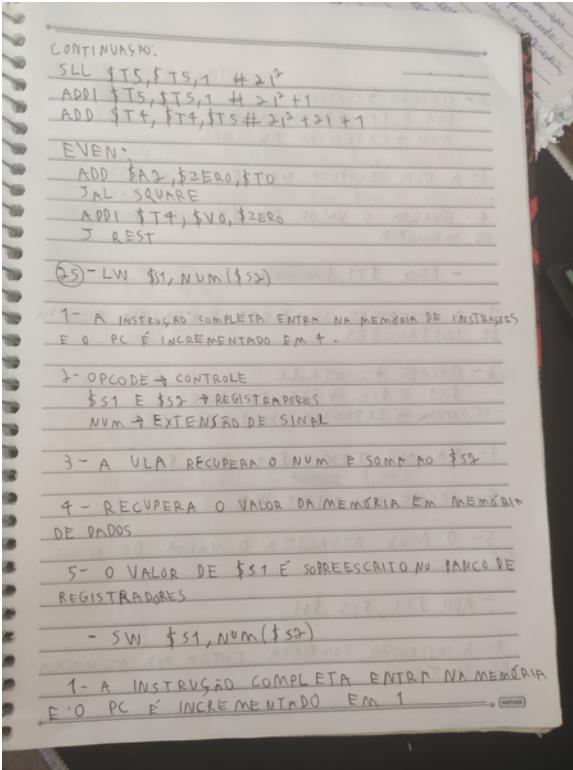
Questões 20 a 24

Q2 # \$50 = SOMA \$51 = A \$52 = 1
 MAINS:
 LUI \$51, 0x1001 # END BASE A
 DO:
 LW \$T0, 0(\$52) # \$T0 = AC1
 ADD \$50, \$50, \$T0 # SOMA + = SOMA
 ADDI \$50, \$52, + # AC1++
 ADDI \$51, \$51, 1 # 1++
 BNE \$51, 100, DO # WHILE (1 < 100)
 # FIM
 ALU = 20+7 = 70, 3%
 MEMORY = 437 = 15,01%
 DESVIO = 476 = 14,63%
 TOTAL = 2910
 CPIm = 0,7334 * 3 + 0,1501 * 5 + 0,1683 * 4
 = 3,6822
 CPU TIME = 605 * 3,6822 * 1/100 = 22,27731
 ADICIONANDO, DOIS NOP'S
 2x SLL \$50, \$50, 0
 ALU = 2549 = 0,7055 = 70,55%
 MEMORY = 538 = 0,1489 = 14,89%
 DESVIO = 526 = 0,1455 = 14,55%
 TOTAL = 3613

CPIm = 0,7055 * 3 + 0,1489 * 5 + 0,1455 * 4
 = 3,443
 SUP = 2910 * 3,6822 / 3,443 = 10775,202 / 12 + 35,550 = 1,16
 ① ALU: 2849 = 0,6765 = 67,65%
 MEMORY: 937 = 0,1750 = 17,50%
 DESVIO: 675 = 0,1984 = 14,84%
 TOTAL: 4211
 CPIm = 0,6765 * 3 + 0,1750 * 5 + 0,1984 * 4
 = 3,4981
 ADICIONANDO 2 NOP'S
 2x SLL \$0, \$0, 0
 ALU: 3346 = 0,6685 = 66,85%
 MEMORY: 935 = 0,1868 = 18,68%
 DESVIO: 734 = 0,1446 = 14,46%
 TOTAL: 5005
 CPIm = 0,6685 * 3 + 0,1868 * 5 + 0,1446 * 4
 = 3,5176
 SUP TOTAL = 4211 * 3,4981 / 5005 * 3,5176 = 1,19

② DEU UM ERRO ENROL CONSEGUI RESOLVER
 ③ TAMBÉM NÃO CONSEGUI FAZER :(
 ④ ~~LUI \$50, 0x1001 # T0 = 0x10010000~~
 LUI \$50, 0x1001 # T0 = 0x10010000
 LW \$T0, 0(\$50) # ENDEREÇO
 LW \$52, 4(\$50) # TAMANHO-VETOR
 SUBI \$52, \$52, 0x1E
 BLT \$ZERO, \$52, CLAMPVALUE
 REST:
 ADDI \$A0, \$51, \$ZERO # A0 = ENDEREÇO
 MEMÓRIA
 ADDI \$A1, \$52, \$ZERO # A1 = TAM VETOR
 ADDI \$T0, \$ZERO, \$ZERO # I = 0
 ADDI \$T1, \$ZERO, \$ZERO # 2 DA DIVISÃO
 ADD \$T4, \$ZERO, \$ZERO # VALOR A SER ARMazenado
 JAL VECTOR
 NOP
 J FIM
 CLAMPVALUE:
 ADDI \$52, \$ZERO, 0X1E
 J REST
 ADD: # PNR
 ADD \$A2, \$ZERO, \$T0
 JAL SQUARE
 ADD \$T5, \$ZERO, \$VO # I>

Continuação da 24 à 26



Questão 27

