COMPSYS 304 Assignment 1

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Q1.

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| (a)  # assumed signed  sra $14, $12, 7 | (b)  #initialise 16 to be used  addi $8, $0, 16  #move to FP register  mtc1 $8, $f8  #convert to double  cvt.d.w $f8, $f8  #multiply and put to register  mul.d $f10, $f12, $f8 |

Q2.

# load index range

addi $t3, $0, 0

addi $t0, $0, 1000

L1:

# increment index by 4 each time

sll $t4, $t3, 2

# get index value of array A

add $t5, $t4, $11

# get index value of array B

add $t6, $t4, $12

# store the fourth byte of A in the first byte of B

# load i-th element of array A into temporary register

lb $t8, 3($t5)

# store the corresponding element of A into B

sb $t8, 0($t6)

# store the third byte of A in the second byte of B

lb $t8, 2($t5)

sb $t8, 1($6)

# store the second byte of A in the third byte of B

lb $t8, 1($t5)

sb $t8, 2($t6)

# store the first byte of A to the fourth byte of B

lb $t8, 0($t5)

sb $t8, 3($t6)

#increment index range by 1

addi $t3, t3, 1

#decrement loop counter

addi $t0, $t0, -1

#check loop counter

bne $t0, $0, L1

Q3.

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| (a)  funct:  # store first argument to temporary register  add $t0, $a0, $0  #store 253 to temporary register, the max length of array  addi $t1, $a1, 253  #initialise the result register  addi $v0, $0, 0  # store ASCII ‘i’ to temporary register  addi $t5, $0, 0x69  # store ASCII ‘n’ to temporary register  addi $t6, $0, 0x6E  # store ASCII ‘null’ to temporary register  addi $t7, $0, 0x00  L1:  # from temporary register  lb $t2, 0($t0)  # test if it is ‘i’  bne $t2, $t5, L2  # load next  lb $t3 ,1($t0)  #check t3 is null  beq $t7, $t3, L3  # test if the next character is ‘n’  bne $t3, $t6, L2  # increment result by 1.  addi $v0, $v0, 1  L2:  #increment to point to next char  addi $t0, $t0, 1  #decrement loop counter  addi $t1, $t1, -1  #check loop counter is not zero  bne $t1, $0, L1  #check t2 is not null  bne $t7, $t2, L1  L3:  jr $ra | (b)  .data  str1: .asciiz "Shervin was in the garden in the morning. "  .text  .globl main    main:  # array base address should be in $a0  la $a0, str1  # array size should be in $a1  ori $a1, $0, 254  jal funct  add $a0, $0, $v0  ori $v0, $0, 1  # print the result  syscall  li $v0, 10  syscall |

Q4.

(a)

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| funct:  # store the arguments into temporary register  # store x  add $t0, $a0, $0  ori $t1, 0  #initialise the result register  ori $t7, $0, 0 # for 3x4  ori $t8, $0, 0 # for 2^n  ori $t9, $0, 0 # for range check  #store some integers to be used  addi $t3, $0, 1  addi $t4, $0, 3  # check x range  #check x < 10  slti $t9, $a0, 10  bne $t9, $t3, Exit  # check if x > 0  blez $a0, Exit  # check n range  # check n < 7  slti $t9, $a2, 7  bne $t9, $t3, Exit  # check n > 0  blez $a2, Exit  #multiply to get 3x and put back to register  mult $a0, $t4  # no overflow so, HI = 0  mflo $t0  #multiply to get (3x)^2  mult $t0, $t0  # no overflow so, HI = 0  mflo $t0  #multiply to get (3x)^4  mult $t0, $t0  # no overflow so, HI = 0  mflo $t0 | #shift y right by n to get y/2^n  sra $t1, $a1, $a2  #initialise the result register  addi $v0, $0, 0  # z = 1  addi $v0, $v0, 1  #z = 1 + (3x)^4  add $v0, $v0, $t0  #z = 1 + (3x)^4+y/2^n  add $v0, $v0, $t1  Exit:  jr $ra |

Q5.

# assume stored in row major format

calculate\_element\_of\_Y:

# get the 5th argumentand put in in $t0. (size of row)

lw $t0, 0($sp)

#initialize FP register pairs $26, $27 with double value 1

addi $t6, $0, 1

mtc1 $t6, $f20

#convert to f26, f27 = 1.0

cvt.d.w $f26, f20

#initialize FP register pairs $28, $29 with double value 8

addi $t6, $0, 8

mtc1 $t6, $f20

#convert to f28, f29 = 8.0

cvt.d.w $f28, f20

# calculate the address of X[i][j]

# address of X[i][j] = base address of X + ((i \* size of row) + j) \* size of data

# (i \* size of row)

mult $a2, $t0

# no overflow so, HI = 0

mflo $t1

# ((i \* size of row) + j)

add $t1, $t1, $a3

# ((i \* size of row) + j) \* size of data

# size of data is 8 bytes = 8 bytes = 2 words

sll $t1, $t1, 3

# $t1 = address of X[i][j]

addu $t1, $t1, $a0

# read X[i][j] (the processor is little-endian)

# $f16,$f17 = X[i][j]

lwc1 $f16, 4($t1)

lwc1 $f17, 0($t1)

# $f16, $f17 = X[i][j] / 8

div.d $f16, $f16, $f28

# Y[i][j] = 1-(X[i][j]/8)

sub $26 ,$f26 , $16

jr $ra