Question1

```
.data
arr: .word 17 5 92 87 27 2 98
sp: .asciiz " "
.text
main:
li $t0,7     #t0 = n = 10
li $t1,6
la $s7,arr
loop1:
        li $t2,0
        loop2:
                addi $t3,$t2,1
                mul $t4,$t2,4
                mul $t5,$t3,4
                add $t4,$s7,$t4
                add $t5,$s7,$t5

                lw $t6,0($t4)          #arr[curr] = t6
                lw $t7,0($t5)          #arr[next] = t7

                slt $s0,$t6,$t7
                beq $s0,1,skip
                sw $t6,0($t5)
                sw $t7,0($t4)

                skip:
                addi $t2,$t2,1
                bne $t2,$t1,loop2
        addi $t1,$t1,-1
        bne $t1,0,loop1
la $s4,arr
li $t1,7
loop:   lw $a0,0($s4)
                addi $s4,$s4,4
                addi $t1,$t1,-1
                li $v0,1
```

```
                syscall
                la $a0,sp
                li $v0,4
                syscall
                bne $t1,0,loop
li $v0,10
syscall
```

Question2

```
.data
input1: .asciiz "Enter the size of the array\n"
input2: .asciiz "Enter the floating point numbers\n"
spe: .asciiz " "
.text
main:
la $a0,input1
li $v0,4
syscall
li $v0,5
syscall
move $s6,$v0
sll $a0,$s6,2
li $v0,9
syscall
move $s7,$v0
la $a0,input2
li $v0,4
syscall
move $t0,$0
move $t1,$s7
loop:beq $t0,$s6,exit
li $v0,6
syscall
swc1 $f0,0($t1)
addi $t1,$t1,4
addi $t0,$t0,1
j loop
```

```
exit:
move $t0,$s6
addi $t0,$t0,-1
loop2:beq $t0,$0,exit2
move $t1,$0
loop3:beq $t1,$t0,exit3
addi $t3,$t1,1
move $t2,$t1
sll $t4,$t2,2
sll $t5,$t3,2
add $t5,$t5,$s7
add $t4,$t4,$s7
lwc1 $f0,0($t4)
lwc1 $f12,0($t5)
c.lt.s $f12,$f0
bc1f again
swc1 $f0,0($t5)
swc1 $f12,0($t4)
again:
addi $t1,$t1,1
j loop3
exit3:
addi $t0,$t0,-1
j loop2
exit2:

move $t0,$0
move $t1,$s7
loop4: beq $t0,$s6,exit4
lwc1 $f12,0($t1)
li $v0,2
syscall
la $a0,spe
li $v0,4
syscall
addi $t1,$t1,4
addi $t0,$t0,1
```

```
j loop4
exit4:
li $v0,10
syscall
```

Question 3

```
.data
arr: .word 5 4 3 2 1 90 0 9
sp: .asciiz " "
.text
main:
li $t0,8     #t0 = n
li $t1,1    #t1 = 1
la $s0,arr
loop1:      move $t2,$t1
            loop2:      beq $t2,0,out2   #t2 = d
                                addi $t3,$t2,-1  #t3 = d-1

                                mul $t4,$t2,4
                                add $t4,$t4,$s0

                                mul $t5,$t3,4
                                add $t5,$t5,$s0

                                lw $t6,0($t4)           #t6 = arr[d]
                                lw $t7,0($t5)   #t7 = arr[d-1]

                                bgt $t6,$t7,out2

                                sw $t6,0($t5)
                                sw $t7,0($t4)

                                addi $t2,$t2,-1
                                j loop2
            out2:
                        addi $t1,$t1,1
                        bne $t1,$t0,loop1
```

```
out1:
la $s3,arr
li $t1,0
loop:	lw $a0,0($s3)
		li $v0,1
		syscall
		addi $s3,$s3,4
		la $a0,sp
		li $v0,4
		syscall
		addi $t1,$t1,1
		bne $t1,$t0,loop
li $v0,10
syscall
```

Question4

```
.data
input1: .asciiz "Enter the size of the array\n"
input: .asciiz "Enter the numbers of the array\n"
spe: .asciiz " "
.text
main:
la $a0,input1
li $v0,4
syscall
li $v0,5
syscall
move $a1,$v0
move $s6,$a1
la $a0,input
li $v0,4
syscall
sll $a0,$a1,2
li $v0,9
syscall
move $s7,$v0
li $a0,0
```

```
move $t0,$s7
#s6 is the size of the array
#s7 is the address of the array
li $a1,0
loop:
beq $a0,$s6,exit
li $v0,5
syscall
sw $v0,0($t0)
addi $t0,$t0,4
addi $a0,$a0,1
j loop
exit:
move $a1,$zero
move $a2,$s6
addi $a2,$a2,-1
jal merge_sort
loop3:
beq $a1,$s6,exit3
sll $t4,$a1,2
add $t4,$t4,$s7
lw $a0,0($t4)
li $v0,1
syscall
la $a0,spe
li $v0,4
syscall
addi $a1,$a1,1
j loop3
exit3:
li $v0,10
syscall
merge_sort:
addi $sp,$sp,-16
sw $ra,0($sp)
sw $a1,4($sp)
sw $a2,8($sp)
```

```
bgt $a2,$a1,continue
j return
continue:

sub $t1,$a2,$a1
srl $t1,$t1,1
add $t2,$t1,$a1
sw $t2,12($sp)
move $a2,$t2
jal merge_sort
lw $a2,8($sp)
lw $a1,12($sp)
addi $a1,$a1,1
jal merge_sort

lw $a1,4($sp)
lw $a2,8($sp)
sub $t0,$a2,$a1
addi $t0,$t0,1
sll $t1,$t0,2
move $a0,$t1
li $v0,9
syscall
move $t7,$v0
lw $t0,12($sp)
move $s4,$t0
move $s5,$a2
addi $s5,$s5,1
addi $s4,$s4,1

sll $s4,$s4,2
sll $s5,$s5,2
move $s2,$zero
move $t1,$a1
sll $t1,$t1,2
lw $t2,12($sp)
addi $t2,$t2,1
```

```
sll $t2,$t2,2
sub $t0,$a2,$a1
addi $t0,$t0,1

loop56:
beq $s2,$t0,exit56
beq $s4,$t1,second
beq $s5,$t2,first

add $t4,$s7,$t2
lw $t4,0($t4)
add $t3,$s7,$t1
lw $t3,0($t3)
bgt $t3,$t4,second
first:
add $t3,$s7,$t1
lw $t3,0($t3)
addi $t1,$t1,4
sw $t3,0($t7)
addi $t7,$t7,4
addi $s2,$s2,1
j loop56
second:
add $t4,$s7,$t2
lw $t4,0($t4)
addi $t2,$t2,4
sw $t4,0($t7)
addi $t7,$t7,4
addi $s2,$s2,1
j loop56
exit56:
move $t1,$zero
move $t1,$a1
sll $t1,$t1,2
move $t9,$zero
move $t8,$0
move $t7,$v0
```

```
loop66:
beq $t8,$t0,exit66
move $t4,$t7
add $t4,$t9,$t4
lw $t5,0($t4)
add $t4,$s7,$t1
sw $t5,0($t4)
addi $t8,$t8,1
addi $t9,$t9,4
addi $t1,$t1,4
j loop66

exit66:
return:
lw $ra,0($sp)
addi $sp,$sp,16
jr $ra
```

Question5

```
.data
input1: .asciiz "Enter the size of the array\n"
input2: .asciiz "Enter the elements of the array\n"
spe: .asciiz " "
.text
main:
la $a0,input1
li $v0,4
syscall
li $v0,5
syscall
move $s6,$v0
move $a0,$s6
sll $a0,$a0,2
li $v0,9
syscall
move $s7,$v0
la $a0,input2
```

```
li $v0,4
syscall
move $t1,$0
move $t0,$s7
loop: beq $t1,$s6,exit
li $v0,5
syscall
sw $v0,0($t0)
addi $t0,$t0,4
addi $t1,$t1,1
j loop
exit:
move $a1,$0
move $a2,$s6
addi $a2,$a2,-1
jal quick_sort
move $t0,$zero
move $t1,$s7
loop5:beq $t0,$s6,exit5
lw $a0,0($t1)
li $v0,1
syscall
la $a0,spe
li $v0,4
syscall
addi $t1,$t1,4
addi $t0,$t0,1
j loop5
exit5:
li $v0,10
syscall
quick_sort:
addi $sp,$sp,-16
sw $ra,0($sp)
sw $a1,4($sp)
sw $a2,8($sp)
bgt $a1,$a2,return
```

```
sub $s0,$a2,$a1
addi $s0,$s0,1
sll $s1,$s0,2
move $a0,$s1
li $v0,9
syscall
move $a0,$v0
sub $t0,$a2,$a1
srl $t0,$t0,1
add $t0,$t0,$a1
move $t1,$s7
move $t3,$0
move $t8,$s7
sll $t0,$t0,2
add $t8,$t0,$s7
lw $t9,0($t8)
loop2: beq $t3,$s0,exit2
sll $t4,$t3,2
add $t4,$s7,$t4
sll $t5,$a1,2
add $t4,$t4,$t5
lw $t4,0($t4)
addi $t3,$t3,1
bge $t4,$t9,asdf
sw $t4,0($v0)
addi $v0,$v0,4
j loop2
asdf:
j loop2
exit2:
sub $t6,$v0,$a0
srl $t6,$t6,2
add $t6,$t6,$a1
sw $t6,12($sp)
move $t3,$0
sw $t9,0($v0)
addi $v0,$v0,4
```

```
li $s5,1
loop3: beq $t3,$s0,exit3
sll $t4,$t3,2
add $t4,$s7,$t4
sll $t5,$a1,2
add $t4,$t4,$t5
lw $t4,0($t4)
addi $t3,$t3,1
beq $t4,$t9,equ
bgt $t4,$t9,asdf1
j loop3
asdf1:
sw $t4,0($v0)
addi $v0,$v0,4
j loop3
equ:
li $a3,1
beq $a3,$s5,go_a
sw $t4,0($v0)
addi $v0,$v0,4
j loop3
go_a:
move $s5,$0
j loop3
exit3:
move $t3,$0
move $t1,$s7
sll $t5,$a1,2
add $t1,$t1,$t5
loop4: beq $t3,$s0,exit4
lw $t4,0($a0)
addi $a0,$a0,4
sw $t4,0($t1)
addi $t3,$t3,1
addi $t1,$t1,4
j loop4
exit4:
```

```
lw $t0,12($sp)
move $a2,$t0
addi $a2,$a2,-1
jal quick_sort
lw $a2,8($sp)
lw $t0,12($sp)
move $a1,$t0
addi $a1,$a1,1
jal quick_sort

return:
lw $ra,0($sp)
addi $sp,$sp,16
jr $ra
```

Question 6

```
.data
input1: .asciiz "Enter the size of the array\n"
input2: .asciiz "Enter the elements of the array\n"
input3: .asciiz "Enter the target\n"
yes: .asciiz "Yes\n"
no: .asciiz "No\n"
.text
main:
la $a0,input1
li $v0,4
syscall
li $v0,5
syscall
move $s6,$v0
sll $a0,$s6,2
li $v0,9
syscall
move $s7,$v0
la $a0,input2
li $v0,4
syscall
```

```
move $t0,$0
move $t1,$s7
loop:beq $t0,$s6,exit
li $v0,5
syscall
sw $v0,0($t1)
addi $t1,$t1,4
addi $t0,$t0,1
j loop
exit:

la $a0,input3
li $v0,4
syscall

li $v0,5
syscall
move $s5,$v0
move $a1,$0
move $a2,$s6
addi $a2,$a2,-1
move $t9,$0
jal binary_search
bne $t9,$zero,exit11
la $a0,no
li $v0,4
syscall

exit11:
li $v0,10
syscall

binary_search:

addi $sp,$sp,-16
sw $ra,0($sp)
sw $a1,4($sp)
```

```
sw $a2,8($sp)

bne $t9,$zero,return
bgt $a1,$a2,return
sub $t0,$a2,$a1
srl $t0,$t0,1
add $t0,$t0,$a1
sw $t0,12($sp)
sll $t1,$t0,2
add $t1,$t1,$s7
lw $t1,0($t1)
beq $t1,$s5,yes1
bgt $t1,$s5,greater
lw $t0,12($sp)
move $a2,$t0
addi $a2,$a2,-1
jal binary_search
j return

yes1:
la $a0,yes
li $t9,1
li $v0,4
syscall
j return
greater:
lw $a2,8($sp)
lw $t0,12($sp)
move $a1,$t0
addi $a1,$a1,1
jal binary_search
j return
return:
lw $ra,0($sp)
addi $sp,$sp,16
jr $ra
```

Question8

```
.data
input1: .asciiz "Enter the size of the array\n"
input2: .asciiz "Enter the elements of the array\n"
spe: .asciiz " "
.text
main:
la $a0,input1
li $v0,4
syscall
li $v0,5
syscall
move $s6,$v0
sll $a0,$v0,2
li $v0,9
syscall
move $s7,$v0
move $t1,$s7
la $a0,input2
li $v0,4
syscall
move $t0,$0
loop:beq $t0,$s6,exit
li $v0,5
syscall
sw $v0,0($t1)
addi $t1,$t1,4
addi $t0,$t0,1
j loop
exit:
move $t0,$0
move $s0,$s6
addi $s0,$s0,-1
loop2:beq $t0,$s0,exit2
move $t1,$t0
addi $t1,$t1,1
move $t2,$t0
```

```
sll $t2,$t2,2
sll $t3,$t0,2
add $t3,$t3,$s7
sll $t9,$t0,2
lw $t4,0($t3)
loop3:beq $t1,$s6,exit3
add $t8,$t2,$s7
lw $t7,0($t8)
sll $t5,$t1,2
add $s1,$t5,$s7
lw $t6,0($s1)
bge $t6,$t7,again
move $t2,$t5
again:
addi $t1,$t1,1
j loop3
exit3:
beq $t2,$t9,again1
add $t2,$t2,$s7
lw $t6,0($t2)
sw $t6,0($t3)
sw $t4,0($t2)
again1:
addi $t0,$t0,1
j loop2
exit2:

move $t0,$0
move $t1,$0
loop4:beq $t0,$s6,exit4
sll $t2,$t1,2
add $t2,$t2,$s7
lw $a0,0($t2)
li $v0,1
syscall
la $a0,spe
li $v0,4
```

```
syscall
addi $t0,$t0,1
addi $t1,$t1,1
j loop4
exit4:

li $v0,10
syscall
```