Page 1

Write cgen for the expression e1+e2

cgen(e1+e2) =

cgen(e1)

```
sw      $a0     0($sp)
addiu   $sp     $sp -4
```

cgen(e2)

```
lw      $t1     4($sp)
add     $a0     $t1 $a0
addiu   $sp     $sp 4
```

Page 2

write code that cgen generates for the expression 5+7

```
li      $a0     5
sw      $a0     0($sp)
addiu   $sp     $sp -4
li      $a0     7
lw      $t1     4($sp)
add     $a0     $t1 $a0
addiu   $sp     $sp 4
```

Page 3

cgen for d1+d2, where d1 = 7 and d2 = 8

cgen(7+8)=

```
li      $a0     7
sw      $a0     0($sp)
addiu   $sp     $sp -4
li      $a0     8
lw      $t1     4($sp)
add     $a0     $t1 $a0
addiu   $sp     $sp 4
```

Page 3

cgen for if d1=d2 then d1+d2 else d1-d2, where d1 = 7 and d2 = 8

```
ccgen(if 7=8 then 7+8 else 7-8)
        li      $a0     7
        sw      $a0     0($sp)
        addiu   $sp     $sp -4
        li      $a0     8
        lw      $t1     4($sp)
        addiu   $sp     $sp 4
        beq     $a0 $t1 true_b
false_b:
        li      $a0     7
        sw      $a0     0$(sp)
        addiu   $sp     $sp -4
        li      $a0     8
        lw      $t1     4($sp)
        sub     $a0     $t1 $a0
        addiu   $sp     $sp 4
        b end_if
true_b:
        li      $a0     7
        sw      $a0     0$(sp)
        addiu   $sp     $sp -4
        li      $a0     8
        lw      $t1     4($sp)
        add     $a0     $t1 $a0
        addiu   $sp     $sp 4
end_if:
```

Page 4

cgen for 3+1

```
li      $a0     3
sw      $a0     0($sp)
addiu   $sp     $sp -4
li      $a0     1
lw      $t1     4($sp)
add     $a0     $t1 $a0
addiu   $sp     $sp 4
```

Page 4

cgen for if x=1 then x else f(1,0)

```
        lw      $a0     4($fp)
        sw      $a0     0($sp)
        addiu   $sp     $sp -4
        li      $a0     1
        lw      $t1     0($sp)
        addiu   $sp     $sp 4
        beq     $t1     $a0 true_b
false_b :
        sw      $fp     0($sp)
        addiu   $sp     $sp -4
        li      $a0     0
        sw      $a0     0($sp)
        addiu   $sp     $sp -4
        li      $a0     1
        sw      $a0     0($sp)
        addiu   $sp     $sp -4
        jal f_entry
        b end_if
true_b:
        lw      $a0     4($fp)
end_if:
```

Page 5,6,7

cgen for (if e1=e2 then e3 else e4)

cgen(if e1=e2 then e3 else e4) =

cgen(e1)

```
sw      $a0     0($sp)
addiu   $sp     $sp -4
```

cgen(e2)

```
lw      $t1     4($sp)
addiu   $sp     $sp 4
beq     $a0 $t1 true_branch
```

false_branch :

cgen(e4)

```
b end_if
```

true_branch :

cgen(e3)

end_if :

Page 5

def f(x,y) = if x= y then x else 0

```
f_entry:
        move    $fp     $sp
        sw      $ra     0($sp)
        addiu   $sp     $sp -4
        lw      $a0     4($fp)
        sw      $a0     0($sp)
        addiu   $sp     $sp -4
        lw      $a0     8($fp)
        lw      $t1     4($sp)
        addui   $sp     $sp 4
        beq     $a0 $t1 true_b
false_b :
        li      $a0     0
        b end_if
true_b :
        lw      $a0     4($fp)
end_if:
        lw      $ra     4($sp)
        addiu   $sp     $sp 16
        lw      $fp     0($sp)
        jr      $ra
```

Page 6

write code that cgen generates for the expression x+5

```
lw      $a0     4($fp)
sw      $a0     0($sp)
addiu   $sp     $sp -4
li      $a0     5
lw      $t1     4($sp)
add     $a0     $t1 $a0
addiu   $sp     $sp 4
```

Page 7

cgen for 5

```
li      $a0     5
```

Page 7

def add(x,y)=x+y+z

add_entry:

```
move    $fp     $sp
sw      $ra     0($sp)
addiu   $sp     $sp -4
lw      $a0     4($fp)          //load x
sw      $a0     0($sp)
addiu   $sp     $sp -4
lw      $a0     8($fp)          //load y
lw      $t1     4($sp)
add     $a0     $t1 $a0
addiu   $sp     $sp 4
sw      $a0     0($sp)          //store x+y
addiu   $sp     $sp -4
li      $a0     z
lw      $t1     4($sp)
add     $a0     $t1 $a0         // add (x+y)+z
addiu   $sp     $sp 4
lw      $ra     4($sp)
addiu   $sp     $sp 16
lw      $fp     0($sp)
jr      $ra
```

Page 7

add(4,5)

```
sw      $fp     0($sp)
addiu   $sp     $sp -4
li      $a0     5
sw      $a0     0($sp)
addiu   $sp     $sp -4
li      $a0     4
sw      $a0     0($sp)
addiu   $sp     $sp -4
jal     add_entry
```