**CSE 305: Computer Architecture**

Class Test 2, July 2015

**Time: 20 minutes**                                                      Full Marks: 20

| Name: | Student No.: |
|---|---|

1. A simple recursive C function and it's corresponding MIPS assembly code is given below. Note that, neither one of them is complete. Please complete them with appropriate expressions.                                                                    10

```
int squareSum(int n){
    if(n<2) return 0;
    else return [            ];
}
```

```
squareSum:
    [    ] $t0, $a0, 1
    beq $t0, $zero, Recurse
    add $v0, $zero, $zero
    jr [    ]
Recurse:
    addi $sp, $sp, -8
    sw $ra, [        ]
    sw [    ], 0($sp)
    addi $a0, $a0,-1
    jal squareSum
    lw [    ], 0($sp)
    lw $ra, [        ]
    [                ]
    mul $t0, $a0, $a0
    add [    ], $t0, $v0
    jr [    ]
```

2. A simple MIPS assembly code snippet and it's corresponding MIPS machine code is given below. Note that, the later one is not complete. Please complete it with appropriate decimal values.                                                              6

```
Loop:   sll $t1, $s3, 2
        add $t1, $t1, $s6
        lw $t0, 0($t1)
        beq $t0, $s5, L1
        j Exit

L1:     addi $s3, $s3, 1
        j Loop

Exit:
```

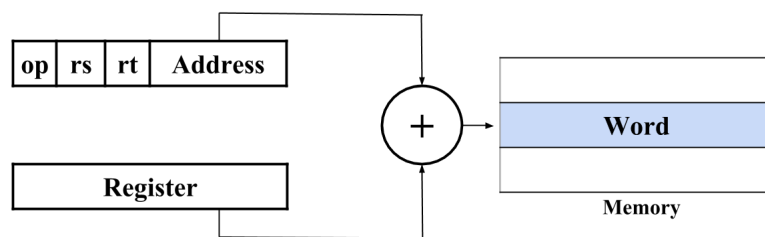| 5000 | 0  | 0  | 19 | 9 | 2 | 0  |
|------|----|----|----|---|---|----|
| 5004 | 0  | 9  | 22 | 9 | 0 | 32 |
| 5008 | 35 | 9  | 8  |   |   |    |
| 5012 | 4  | 8  | 21 |   | 1 |    |
| 5016 | 3  |    |    |   |   |    |
| 5020 | 8  | 19 | 19 |   | 1 |    |
| 5024 | 2  |    |    |   |   |    |
| 5028 |    |    |    |   |   |    |

3. Please draw the illustrations of the five MIPS addressing modes. For your convenience one of them is drawn below.

4

   (a) Immediate Addressing

   (b) Register Addressing

   (c) Base Addressing

| op | rs | rt | Address |

```
           ┌──────────────┐
           │              ↓
        ┌──────────┐    (+) →  ┌──────────┐
        │ Register │    ↑      │   Word   │
        └──────────┘    │      └──────────┘
           └────────────┘         Memory
```

   (d) PC-relative Addressing

   (e) Pseudodirect Addressing