Assembly Language and Computer Architecture Lab

Mid-term exam

Problem 1

a) Identify memory address

- addiu (line 9): 0x00400014
- sw (line 11): 0x0040001c
- la (line 35): 0x00400064
- bgtz (line 46): 0x00400098

b) Explain machine codes

***Explain**: Each table has different columns for each type of instruction. For rows, first 2 rows used to analyze each field in the machine code, then combine them into a binary code at 3rd row, and convert to hexa-decimal at the last row.*

- addiu (line 9): 0x240a0001

  Basic code: **addiu $t2, 1**

Op (6 bits)	Rs (5 bits)	Rd (5 bits)	Immediate (16 bits)
001001 *(operation code for addiu)*	00000 *(address of source register is zero because we don't need it)*	01010 *(address of destination register $t2)*	0000 0000 0000 0001 *(value of immediate 1 in binary)*
0010 0100 0000 1010 0000 0000 0000 0001			
0x240a0001			

- sw (line 11): 0xad0a0000

  Basic code: **sw** **$t2, 0($t0)**

Op (6 bits)	Rs (5 bits)	Rd (5 bits)	Immediate (16 bits)
101011 *(operation code for sw)*	01000 *(address of source register $t0)*	01010 *(address of destination register $t2)*	0000 0000 0000 0000 *(value of immediate 0 in binary)*
1010 1101 0000 1010 0000 0000 0000 0000			
0xad0a0000			

- la (line 35): 0x3c011001

  Basic code: **lui** **$1, 0x00001001** machine code: 0x3c011001

Op (6 bits)	Rs (5 bits)	Rd (5 bits)	Immediate (16 bits)
001111 *(operation code for lui)*	00000 *(address of source register is zero because we don't need it)*	00001 *(address of destination register $1)*	0001 0000 0000 0001 *(value of immediate 0x00001001 in binary)*
0011 1100 0000 0001 0001 0000 0000 0001			
0x3c011001			

  Basic code: **ori** **$4, $1, 0x00000036** machine code: 0x34240036

Op (6 bits)	Rs (5 bits)	Rd (5 bits)	Immediate (16 bits)
001101 *(operation code for ori)*	00001 *(address of source register $1)*	00100 *(address of destination register $4)*	0000 0000 0011 0110 *(value of immediate 0 in binary)*
0011 0100 0010 0100 0000 0000 0011 0110			
0x34240036			

- bgtz (line 46): 0x1d20fff6

  Basic code: **bgtz** **$9, 0xffffff6** addr: 0x1d20fff6

Op (6 bits)	Rs (5 bits)	Rd (5 bits)	Immediate (16 bits)
000111 *(operation code for bgtz)*	01001 *(address of destination register $9)*	00000 *(address of destination register is zero because we don't need it)*	1111 1111 1111 0110 *(value of immediate 0xffffff6 in binary)*
0001 1101 0010 0000 1111 1111 1111 0110			
0x1d20fff6			