TPS Questions:

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5.) How many bits does a machine instruction contain?
32 bits

6.) How many types are there? What are they? Give 2 operations for each type as examples.
There are three types of format:
R Format: add, jr
I Format: lw, addi
J Format: j, jal

7.) Translate   addi $s0, $zero, 25

a.) I Format; this has 4 fields; opcode, rt, rs , immediate
b.) 8, $zero, 0 , $s0, 10, 19
c.) Binary: 001000 00000 10000 0000000000011001 || Hex: 0x20100019

8.)

a.) Hex: 0x0230402a || Binary: 0000 0010 0011 0000 0100 0000 0010 1010
b.) R Format; The first 6 bits are 0, which is the opcode for slt; 6 instructions;
Opcode, rs, rt, rd, shamt, function
c.) opcode 0; rs 0x11; rt 0x10; rd 0x8; shamt 0x0; funct 0x2a;
d.) This functionis slt; you can tell by the first 6 bits and the last 6 bits; R[rd] = (R[rs] < R[rt])
e.) slt $t0, $s1, $s1, yes it is.

9.)

a.) I Format
b.) opcode 0x5; rs 0x8; rt 0x0; imm 0x00000001;
c.) LESS, 0x0040001c
d.)yes, we are jumping to the new branch of commands so we have to put the address location of the next line of code
e.) We can find it on basics of mars; the value is 0x00000004
f.) The machine code is: 0x15000001 Binary: 0001 0101 0000 0000 0000 0000 0000 0001
Yes this is the same as in the code column.

10.)

a.) This is j-format, and it has 2 fields

b.) hex is 0x2

c.) it jumps to address 0x00400044 and the label is END

d.) You can use 25 bits; we can squeeze the address by adding more zeros or removing the unwanted zeros; It doesn't change the address location just how many zeros we use;

e.) In hex it is 0x08100011; Binary: 0000 1000 0001 0000 0000 0000 0001 0001, yes it is the same

Assignment 1 Conversion in proc2.s

Line #7

Addi $s0, $zero, -15

Opcode: 8	Rs: $0,$zero	Rt: $16, $s0	Imm: -15

Num:Hex:Binary

8:8:1000

0:0:0000

16:10:10000

-15:-f:-1111

Machine Code:
0x2010fff1

Line #14

Slt $t0, $s0, $s1

Opcode: 0	Rs: $s0, $16	Rt: $s1, $17	Rd : $t0,$8	Shamt:1	Funct: 2a

Num:Hex:Binary

0:0:0000

16:10:10000

17:11:10001

8:8:1000

1:1:0001

2a:2a:00101010

Machine Code:
0x0211402a

Line #17

Beq $t0, $zero, LEEQ

Opcode: 4	Rs: $8, $t0	Rt: $0, $zero	Imm: LEEQ

Num:Hex:Binary
4:4:0100
8:8:1000
0:0:0000
6:6:0110
Machine Code:
0x11000006

Line #20

J GRT

Opcode: 2	Address: 0x0040001c

Num:Hex:Binary
2:2:0010
:0040001c:0100 0000 0000 0000 0001 1100
Machine Code:
0x08100007

Instruction<31:0>

Inst Memory Adr

<21:25> Rs
<16:20> Rt
<11:15> Rd
<0:15> Imm16

nPC_sel
RegDst
Rd Rt
1 0

RegWr Rs Rt
5 5 5

Equal
ALUctr
MemWr
MemtoReg

4
Adder
Mux
0
1
PC
00
clk

PC Ext
Adder
imm16

busW
32
RegFile
Rw Ra Rb
busA 32
busB
32
clk

=
A
L
U
32

32
WrEn Adr
Data In
Data Memory
clk

imm16
Extender
16 32

Data In
32

1

ExtOp ALUSrc
(Signed or Zeros)

nPc_sel	ExtOp	ALUsrc	ALUctr	MemWr	MemtoReg	RegDst	RegWr
1	0	1	1	0	0	0	1