Answer All the Questions

1. (5 points) Show MIPS instruction “lw $16, 0x04($18)” with its various fields presented in the 32-bit instruction format below.

<table>
<thead>
<tr>
<th>31-26</th>
<th>25-21</th>
<th>20-16</th>
<th>15</th>
<th>5-0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18</td>
<td>16</td>
<td></td>
<td>0x04</td>
</tr>
</tbody>
</table>

   opcode 18

2. (5 points) Show the format of “jump Address” instruction in terms of its various field contents of 32-bit instruction. Explain how this instruction works using RTL. (Note: RTL gives the meaning of the instruction)

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   opcode
   jump target address/4
   (without the trailing 2; 0 bits)

3. (3 points) What are the various components you would need designing datapath of MIPS Architecture? List the classic components.
   - ALU
   - REGS
   - WIRES

4. (2 points) Why instructions in MIPS are of the same size?
   - TO MAKE EFFICIENT & SIMPLE

5. (5 points) State True/False in [ ] below.
   T a. [ ] A machine with 32 general purpose registers requires 5 bits to encode a register in register-file.
   F b. [ ] Different architectures use the same assembly programming language by its assembler.
   F c. [ ] Instruction fetch is a write cycle associated with memory to deliver an instruction.
   F d. [ ] Target address in jump instruction is 28 bits to calculate the effective target address.
   T e. [ ] l-type instruction such as ORI uses zero-extension logic unit to provide effective operation.

6. (15 points) Execute the following MIPS code fragments, showing the changes that occur in the register file and memory. Show only the changes in Hexadecimal.

   Addi $19,$0, 0x20
   Lw $17, 0x04($19)
   Add $20,$19,$16
   Sw $20, 0x08($19)
7. (5 points) What pseudo instruction is implemented with following pair of instructions?

Slt $1, $16, $17
Bne $1, $0, Loop

BLT $16, $17, Loop

8. (10 points) Write MIPS code that prompts the user to enter two numbers, adds the numbers, and prints the result. The prompts should be "Number 1?" and "Number 2?". When the code prints the number, it should print "The result is X", where "X" is the sum.

- write the program yourself (using syscall of)