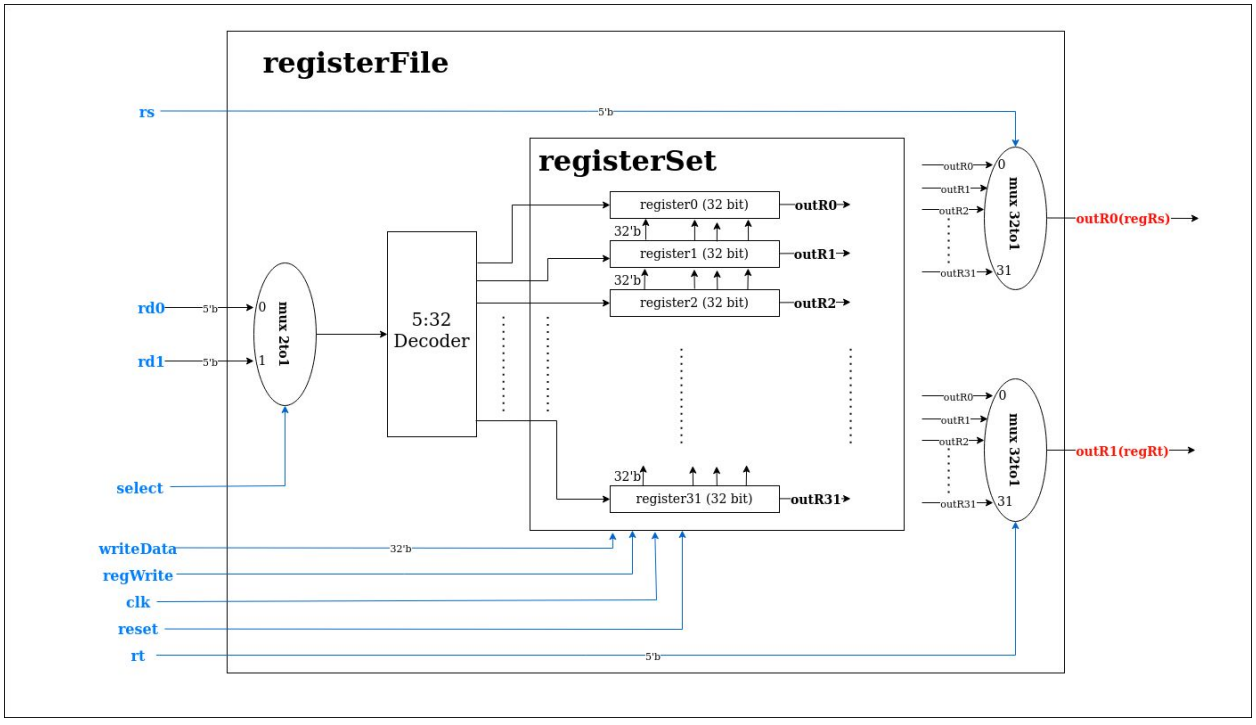
BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI K. K. BIRLA Goa Campus
First Semester 2020-2021
CS F342 Computer Architecture
Lab assignment no. 2

Implement the following design using Verilog HDL. Download registerFile.v file and modify it to get the desired waveform in GTKWave as shown below.

Theory:
A datapath consists of all the components used to execute an instruction. A major component used for all instructions is the Register file.
Registers are temporary storage locations inside the CPU that hold data and addresses. The register file is the component that contains all the general purpose registers of the microprocessor.

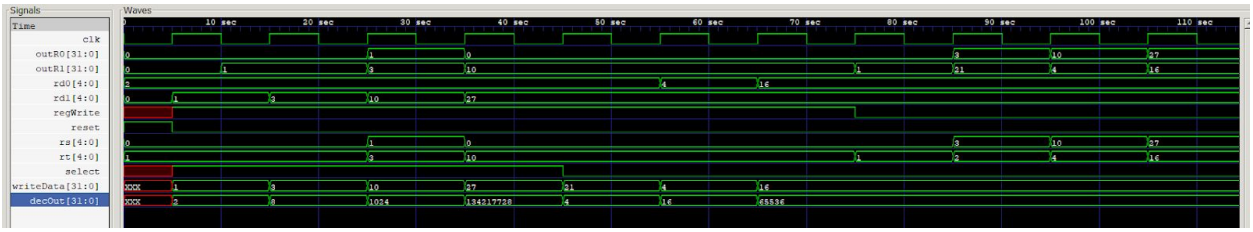
Circuit Design:
https://drive.google.com/file/d/1ZWd8Gq7uwu866UTD8HG4_S0678_SqPog/view?usp=sharing



Explanation of the circuit:
The rs, rt and rd are 5 bit values given to the decoder to generate a 32 bit address. This is used by the register set to obtain the data at that address.
The register set consists of 32 registers of 32 bits each. Each register is made of D flip flops.
The outputs from the register set are passed through 32to1 multiplexers with rs and rt as the

select values to obtain the final outputs regRs and regRt. These values (data in the addressed register) are either read or written over depending on the instruction being executed.

Output Waveform:
https://drive.google.com/file/d/1BUNKD7HpkGQtQgi6S3_F6GUPPeC1k8M9/view?usp=sharing



Marking Scheme:

2 Marks - outR0(regRs) and outR1(regRt) signals
2 Marks - decOut signal

Submission Method:

1. Save your registerFile.v source file as **<YourID>_Lab2.v**
   NOTE: Change yourID to your 13 digit BITS ID in the testbench
2. Save the vcd dump file generated as **<YourID>_Lab2.vcd (this will already be called <YourID>_Lab2.vcd since you have changed it in the testbench)**
3. Save your GTKWave output as **<YourID>_Lab2.gtkw** using the 'Save As' option in File->Write

Create a **zip file** containing the above 3 files and submit it on Quanta. **Do not create archives in other formats (rar, tar.gz etc).**
Once uploaded on Quanta, remember to **submit for grading**. Do not leave it as a draft.