Lab 7. CPU Arithmetic Logical Unit

Write code for a CPU ALU block that deals with 4 types of operations. Bitwise, Arithmetic, Branching and Shifting. The block should have following I/O:

A_input, B_input – 32bits long

Cmd – 4 bits long

ALU_enable, sh,

Shamt – what's most logical for ALU block

Results – 33 bits long

NZCV – 4 bits long

Cmd is for choosing an operation mode, sh is for specifying the shifting mode, Shamt is for specifying the shifting amount.
The block should more specifically make following operations:

Bitwise: B_or, B_and, B_xor, B_add, B_sub, B_rev_sub

Arithmetic: add_carry, sub_carry, sub_rev_carry

Branching: BEQ, BNE, BGT, BGE, BLT, BLE

Shifting: Shift_right, Shift_left

NZCV is an output used for flags, where N = Negative, Z = Zero, C = Carry, V = overflow.

C is only needed during the shifting operation, while bitwise operations don't care about flagging.

Show Timing Diagrams and upload the lab in PDF formats.