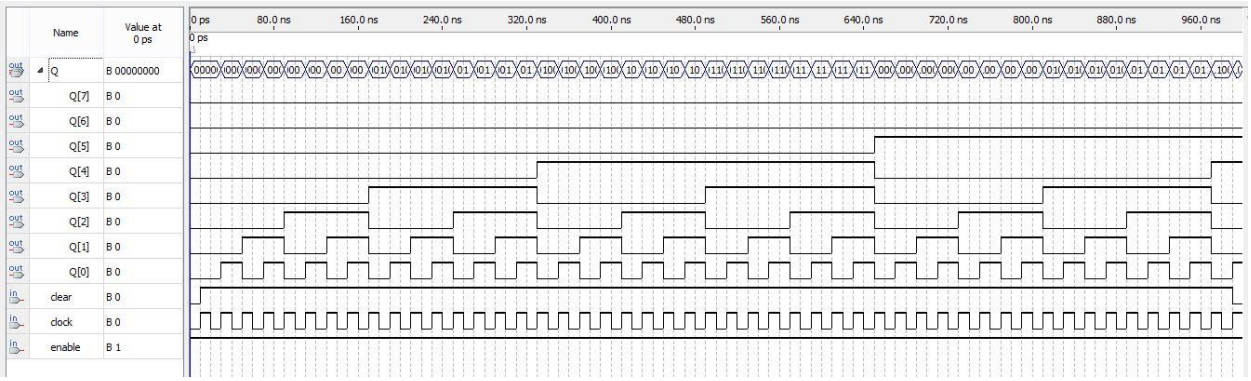
Lab Four Notes and Comments:

Part 1:

No issues encountered, except had to look up how T flip-flops worked, as had slipped my mind. Wrote code based on the diagram, using basic logic elements.

Simulations (shows counter works):

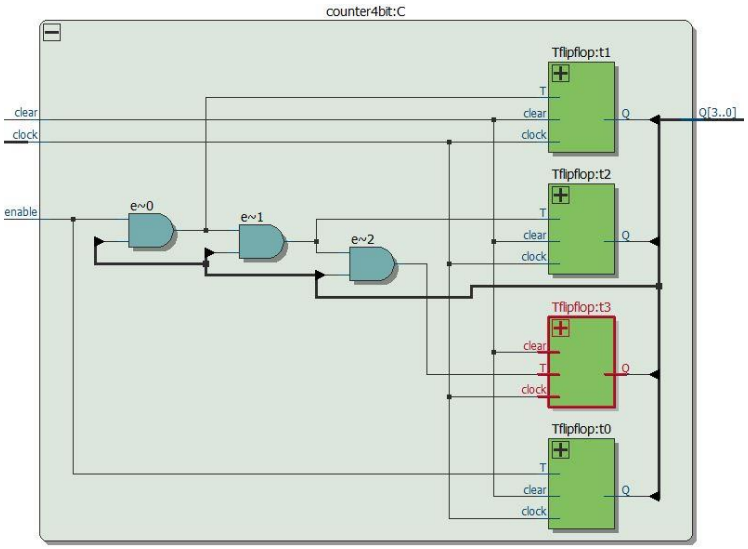


Answers to questions in specific parts:

1-Total logic elements =13

Fmax = 440 MHz

5- No difference in implementation in quartus vs the diagram in the lab description



Part 2:

Behavioural description of a counter is definitely easier to implement. No issues encountered. See file part2-RTLViewer.pdf

Total logic elements = 17

Fmax = 489 MHz

Part 3:

Implemented the counter from LPM. See file part2-RTLViewer.pdf. Essentially the same as in part 2

Total logic elements = 17

Fmax = 489 MHz

Part 4:

Implemented a circuit to count 0-9 and display the digit on a seven segment display. Used the 50 MHz clock to driver a 1 second timer to clock the counter. No issues encountered.

Part 5:

Implemented a ticker tape like display of the word 'HELLO' on the seven segment displays. Re-used the code from Lab 1 part 6, with the switch provided by a counter, instead of from user input. Previously had the word determined by user input, switched to constant value wires as only wanted the one arrangement of the letters. No difficulties encountered.