

7. (20 points) A JAH flip-flop has four operations, clear to 0, set to 1, no change, and complement, when inputs are P and N are 00, 01, 10, and 11, respectively.
- Tabulate the characteristic table.
 - Derive the characteristic equation.
 - Tabulate the excitation table.

8. (15 points) Reduce the number of states in the following state table, and tabulate the reduced state table:

Present State	Next State		Output	
	$x = 0$	$x = 1$	$x = 0$	$x = 1$
S0	S1	S4	0	0
S1	S2	S1	0	0
S2c	S1	S6	0	0
S3	S1	S3	0	0
S4	S5	S4	0	0
S5	S2	S1	0	0
S6	S5	S3	0	1

9. (25 points) Design a 3-bit counter which counts in the sequence 001, 011, 010, 110, 100, 000, 001 using clocked T flip-flops. You do not have to draw the circuit diagram. What will happen if the counter is started in state 111?

10. (20 points) Design a Mealy sequential circuit that has an output of 1 whenever its input string has at least two 1s in sequence and otherwise has an output of 0. Use JK flip-flops. You do not have to draw the circuit diagram.

Input: 001010111010001111101010101111000011001

Output: 000000011000000111100000000111000001000