EGR 270
Fundamentals of Computer Engineering
File: Modseq.opj

Modified Sequence Counter

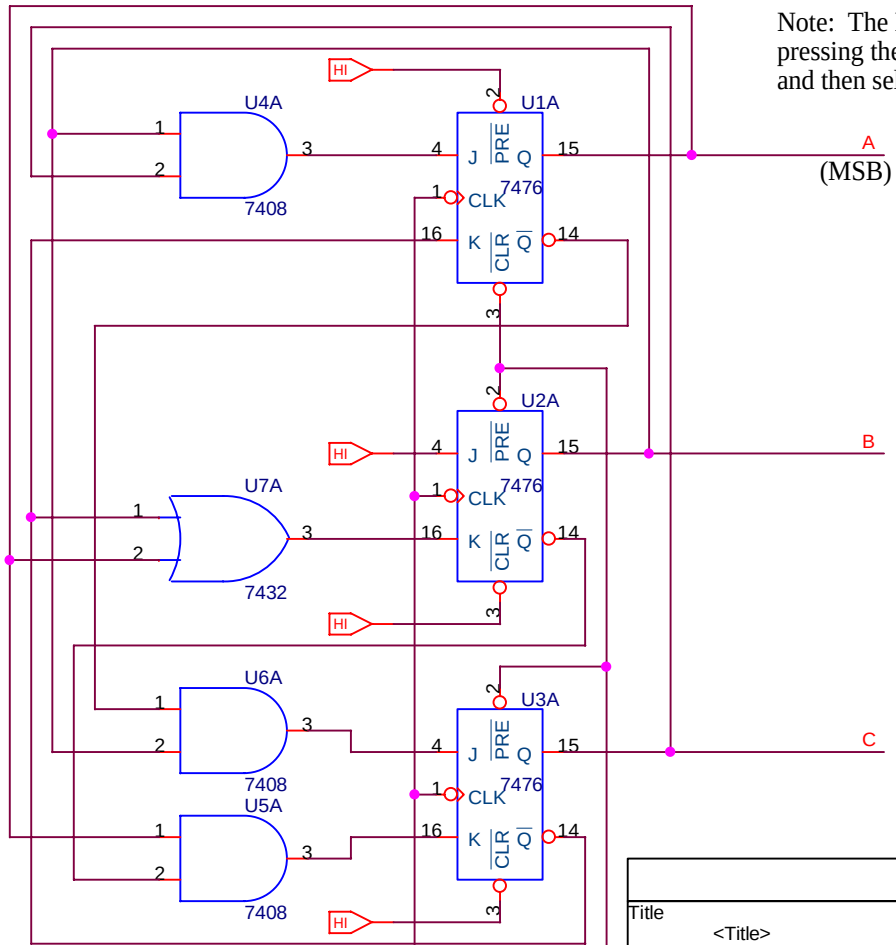
Purpose: A counter has been designed to count in the sequence 0, 2, 1, 3, 7, 5, 6, and repeat using JK flip-flops and the excitation table method. See the attached sheet for the details of the design.

A Digital Clock was used to generate a 1kHz input to clock the counter. Additionally, PSPICE requires that synchronous devices be initialized, so another Digital Clock is used to briefly provide a LOW pulse to initialize the counter to 3 (use ClearA, Preset B, and PresetC to preset to 011). The unused Preset and Clear lines must be tied HIGH.

Analysis: A TRANSIENT analysis with a final time of 10ms is used to show ten output counts since the period of the clock is 1ms (1/1kHz).

Note: The results of the design by the excitation table method are as follows:

JA = BC KA = C'
JB = 1 KB = A + C'
JC = A' + B KC = A + B'



Note: The HI input is available by pressing the GND icon on the toolbar and then selecting $D_HI/SOURCE

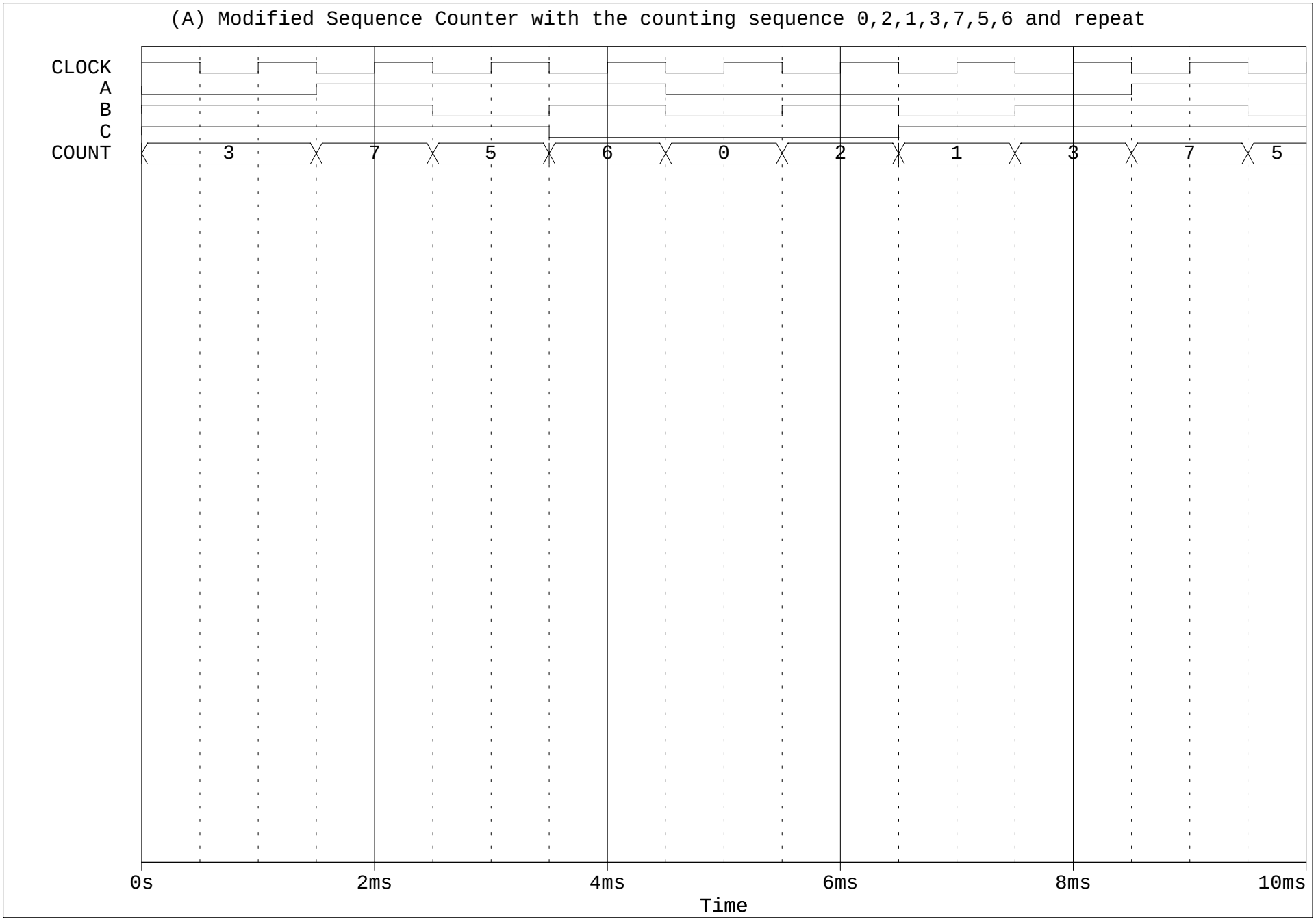
OFFTIME = .5ms
ONTIME = .5ms
DELAY = 0
STARTVAL = 0
OPPVAL = 1
DSTM1
CLK
CLOCK

OFFTIME = 50ms
ONTIME = 25ns
DELAY = 10ns
STARTVAL = 1
OPPVAL = 0
DSTM2
CLK
INIT

Title <Title>		
Size A	Document Number <Doc>	Rev <RevCode>
Date: Monday, April 03	Sheet 1 of 1	

** circuit file for profile: Transient

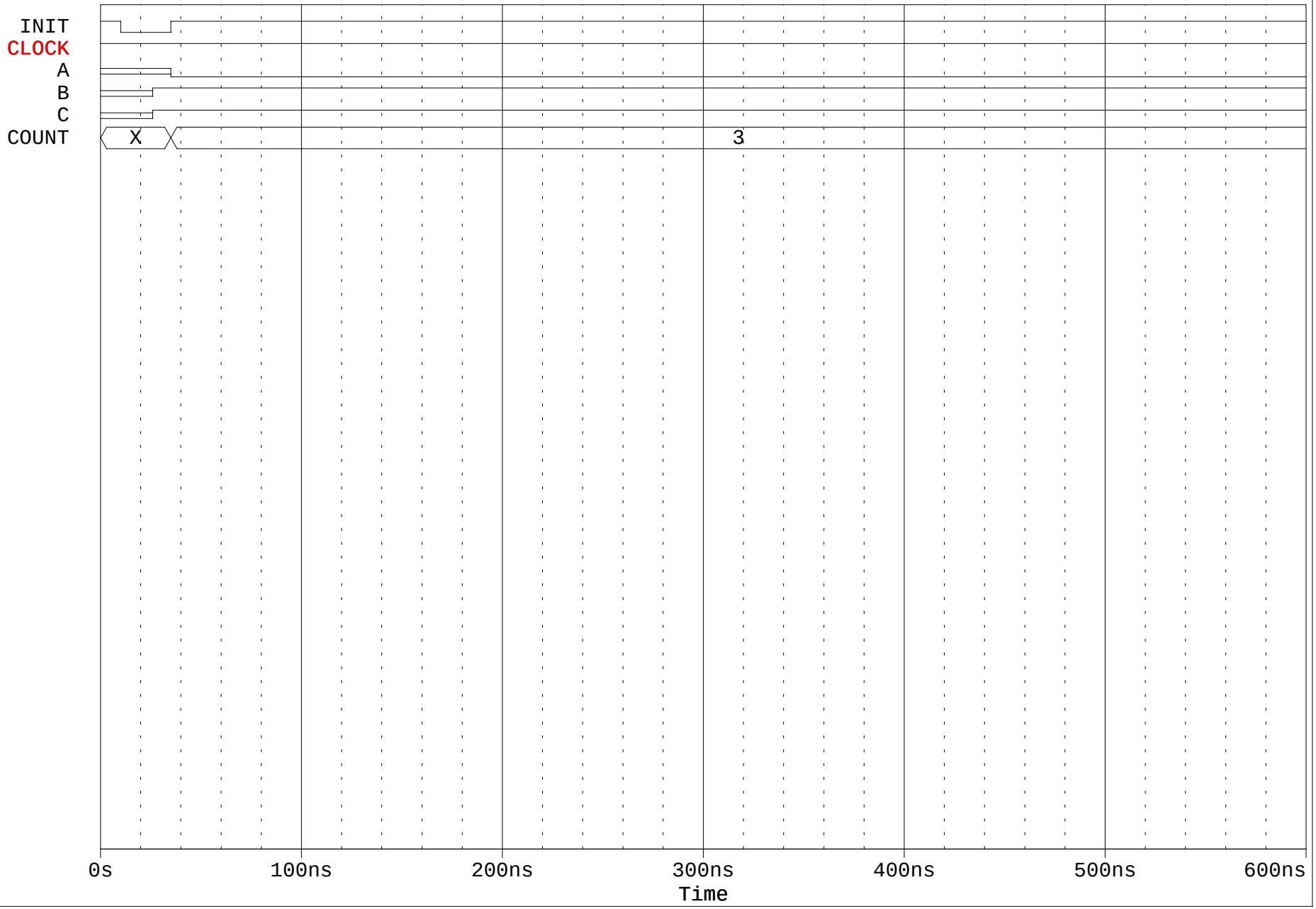
Date/Time run: 04/03 22:32:27 Temperature: 27.0



** circuit file for profile: Transient

Date/Time run: 04/03 22:32:27 Temperature: 27.0

(A) Zooming in on the initialization pulse shows the counter being initialized to count 3



Example: Design a modified sequence counter using the excitation table method that will count in the sequence 0,2,1,3,7,5,6, and repeat. Treat unused count 4 as a "don't care". Use JK flip-flops.

Circuit Excitation Table

Present State			Next State			Flip-flop Inputs					
A	B	C	A	B	C	JA	KA	JB	KB	JC	KC
0	0	0	0	1	0	0	X	1	X	0	X
0	0	1	0	1	1	0	X	1	X	X	0
0	1	0	0	0	1	0	X	X	1	1	X
0	1	1	1	1	1	1	X	X	0	X	0
1	0	0	X	X	X	X	X	X	X	X	X
1	0	1	1	1	0	X	0	1	X	X	1
1	1	0	0	0	0	X	1	X	1	0	X
1	1	1	1	0	1	X	0	X	1	X	0

JK Flip-flop Excitation Table

Q(t)	Q(t+1)	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

Flip-flop Input Functions and Circuit Output Functions

A \ BC	00	01	11	10
0	0	0	1	0
1	X	X	X	X

JA = BC

A \ BC	00	01	11	10
0	1	1	X	X
1	X	1	X	X

JB = 1

A \ BC	00	01	11	10
0	0	X	X	1
1	X	X	X	0

JC = A'B

A \ BC	00	01	11	10
0	X	X	X	X
1	X	0	0	1

KA = C'

A \ BC	00	01	11	10
0	X	X	0	1
1	X	X	1	1

KB = A + C'

A \ BC	00	01	11	10
0	X	0	0	X
1	X	1	0	X

KC = AB'