

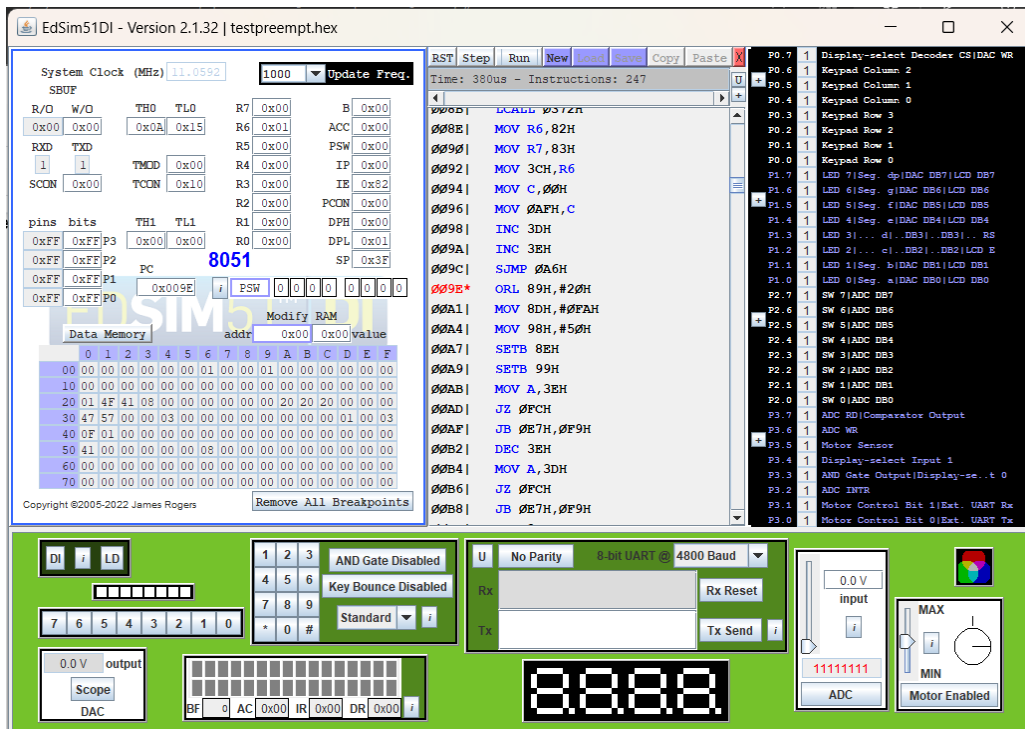
Programming Project Checkpoint#3

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[1] Typescript for compilation

```
Ubuntu [2022-12-05 14:16:31] jojoelt@ZephyrG14:~/OS-edsim/chkpnt3 (master *)
$ make clean
rm *.hex *.ihx *.lnk *.lst *.map *.mem *.rel *.rst *.sym
rm: cannot remove '*.ihx': No such file or directory
rm: cannot remove '*.lnk': No such file or directory
make: *** [Makefile:25: clean] Error 1
(sdcc) [2022-12-05 14:16:33] jojoelt@ZephyrG14:~/OS-edsim/chkpnt3 (master *)
$ make
sdcc -c testpreempt.c
sdcc -c preemptive.c
preemptive.c:142: warning 85: in function ThreadCreate unreferenced function argument : 'fp'
sdcc -o testpreempt.hex testpreempt.rel preemptive.rel
(sdcc) [2022-12-05 14:16:34] jojoelt@ZephyrG14:~/OS-edsim/chkpnt3 (master *)
$
```

[2] Screenshots and explanation



At first, Semaphores are initialized with:

@0x3D: mutex = 1 | @0x3E: full = 0 | @0x3F: empty = 3

Producer Running

EdSim51DI - Version 2.1.32 | testpreempt.hex

System Clock (MHz): 11.0592 | Update Freq. 100

Time: 83ms 831us - Instructions: 49670

Registers: R7: 0x00, B: 0xF5, R6: 0x0F, ACC: 0x00, R5: 0x00, PSW: 0xC8, R4: 0x00, IP: 0x00, R3: 0x00, IE: 0x82, R2: 0x00, PCON: 0x00, R1: 0x00, DPH: 0x00, R0: 0x00, DPL: 0x0F, SP: 0x4F

PC: 8051

Data Memory: 0x0000 to 0x00FF

Instruction List:

```

0046: JZ 0FCH
0048: JB 0E7H,0F9H
004B: DEC 3FH
004D: MOV A,3DH
004F: JZ 0FCH
0051: JB 0E7H,0F9H
0054: DEC 3DH
0056: SETB 00H
0058: JBC 0AFH,02H
005B: CLR 00H
005D: MOV A,3BH
005F: ADD A,#2AH
0061: MOV R1,A
0062: MOV R7,3CH
0064: MOV A,#41H
0066: ADD A,R7
0067: MOV R1,A
0068: MOV R6,3BH
006A: MOV R7,#00H
006C: MOV 82H,R6
006E: MOV 83H,R7
    
```

I/O Panel: LD, AND Gate Disabled, Key Bounce Disabled, Standard, 0.0V output, DAC, 8888, 0.0V input, 11111111, MAX, MIN, Motor Enabled.

After writing the nextProduce in the buffer.

EdSim51DI - Version 2.1.32 | testpreempt.hex

System Clock (MHz): 11.0592 | Update Freq. 100

Time: 95ms 908us - Instructions: 56565

Registers: R7: 0x00, B: 0x00, R6: 0x00, ACC: 0x00, R5: 0x00, PSW: 0x80, R4: 0x00, IP: 0x00, R3: 0x00, IE: 0x82, R2: 0x00, PCON: 0x00, R1: 0x2C, DPH: 0x00, R0: 0x00, DPL: 0x00, SP: 0x3F

PC: 8051

Data Memory: 0x0000 to 0x00FF

Instruction List:

```

0090: MOV R7,83H
0092: MOV 3CH,R6
0094: MOV C,00H
0096: MOV 0AFH,C
0098: INC 3DH
009A: INC 3EH
009C: Sjmp 0A6H
009E: ORL 89H,#0FAH
00A1: MOV 8DH,#0FAH
00A4: MOV 98H,#50H
00A7: SETB 8EH
00A9: SETB 99H
00AB: MOV A,3EH
00AD: JZ 0FCH
00AF: JB 0E7H,0F9H
00B2: DEC 3EH
00B4: MOV A,3DH
00B6: JZ 0FCH
00B8: JB 0E7H,0F9H
00BB: DEC 3DH
00BD: JNB 99H,0FDH
    
```

I/O Panel: LD, AND Gate Disabled, Key Bounce Disabled, Standard, 0.0V output, DAC, 8888, 0.0V input, 11111111, MAX, MIN, Motor Enabled.

Before the next round of writing nextProduce in the buffer.

Now in the Producer, (we have buffer of 3), after we write the nextProduce in the 0x2A, 0x2B, 0x2C, the empty semaphore is now zero, (which means the buffer is full), so we will wait until Timer interrupt to switch to Consumer

Consumer Running

EdSim51DI - Version 2.1.32 | testpreempt.hex

System Clock (MHz): 11.0592 | 100 Update Freq.

SBUF

R/O	W/O	TH0	TL0	R7	0x00	B	0x00
0x00	0x00	0x0D	0x09	R6	0x01	ACC	0x01
RXD	TxD			R5	0x00	PSW	0x01
1	1	TMOD	0x20	R4	0x00	IP	0x00
SCON	0x52	TCON	0x00	R3	0x00	IE	0x52
				R2	0x00	PCON	0x00
				R1	0x00	DPH	0x00
				R0	0x00	DPL	0x01
						SP	0x3F

pins bits TH1 TL1
0xFF 0xFF P3 0xFA 0xFF
0xFF 0xFF P2
0xFF 0xFF P1
0xFF 0xFF P0

PC: 0x00BD | PSW: 0 0 0 0 0 0 0 1

Data Memory

addr	0x00	0x00	value
0	00	00	00
1	00	00	00
2	00	00	00
3	00	00	00
4	00	00	00
5	00	00	00
6	00	00	00
7	00	00	00
8	00	00	00
9	00	00	00
A	00	00	00
B	00	00	00
C	00	00	00
D	00	00	00
E	00	00	00
F	00	00	00

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Remove All Breakpoints

Assembly Code:

```

0090 MOV R7,83H
0092 MOV 3CH,R6
0094 MOV C,00H
0096 MOV 0AFH,C
0098 INC 3DH
009A INC 3EH
009C SJMP 0A6H
009E ORL 89H,#20H
00A1 MOV 8DH,#0FAH
00A4 MOV 98H,#50H
00A7 SETB 8EH
00A9 SETB 99H
00AB MOV A,3EH
00AD JZ 0FCH
00AF JB 0E7H,0F9H
00B2 DEC 3EH
00B4 MOV A,3DH
00B6 JZ 0FCH
00B8 JB 0E7H,0F9H
00BB DEC 3DH
00BD JNB 99H,0FDH
    
```

Hardware Panel:

- DI, LD buttons
- 7-segment display: 8888
- 0.0 V output DAC
- AND Gate Disabled, Key Bounce Disabled, Standard
- UART: No Parity, 8-bit UART @ 4800 Baud
- Rx, Tx fields and buttons
- ADC: 0.0 V input, 11111111, MAX, MIN, Motor Enabled

EdSim51DI - Version 2.1.32 | testpreempt.hex

System Clock (MHz): 11.0592 | 100 Update Freq.

SBUF

R/O	W/O	TH0	TL0	R7	0x00	B	0xFF
0x00	0x42	0x46	0x1B	R6	0x02	ACC	0x01
RXD	TxD			R5	0x00	PSW	0xC1
1	1	TMOD	0x20	R4	0x00	IP	0x00
SCON	0x50	TCON	0x00	R3	0x00	IE	0x82
				R2	0x00	PCON	0x00
				R1	0x2B	DPH	0x00
				R0	0x00	DPL	0x02
						SP	0x3F

pins bits TH1 TL1
0xFF 0xFF P3 0xFA 0xFF
0xFF 0xFF P2
0xFF 0xFF P1
0xFF 0xFF P0

PC: 0x00DD | PSW: 1 1 0 0 0 0 0 1

Data Memory

addr	0x00	0x00	value
0	00	00	2B
1	00	00	00
2	00	00	00
3	00	00	00
4	00	00	00
5	00	00	00
6	00	00	00
7	00	00	00
8	00	00	00
9	00	00	00
A	00	00	00
B	00	00	00
C	00	00	00
D	00	00	00
E	00	00	00
F	00	00	00

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Remove All Breakpoints

Assembly Code:

```

0090 MOV R7,83H
0092 MOV 3CH,R6
0094 MOV C,00H
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009E ORL 89H,#20H
00A1 MOV 8DH,#0FAH
00A4 MOV 98H,#50H
00A7 SETB 8EH
00A9 SETB 99H
00AB MOV A,3EH
00AD JZ 0FCH
00AF JB 0E7H,0F9H
00B2 DEC 3EH
00B4 MOV A,3DH
00B6 JZ 0FCH
00B8 JB 0E7H,0F9H
00BB DEC 3DH
00BD JNB 99H,0FDH
    
```

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- DI, LD buttons
- 7-segment display: 8888
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- AND Gate Disabled, Key Bounce Disabled, Standard
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0x3D, and 0x3E changes where 0x3D is the mutex locks, and 0x3E is the full semaphores, it all decreased by one by SemaphoreWait, then after 3 tries, the semaphores full will be zero, and the semaphores empty will be 3, then after that, because the buffer is full, after timer interrupt, it will trigger the thread switch.