

2. Fairness

How “fair” is your scheduler based on the output that you observe?

I think that my scheduler based on the output is very fair. Since my output is A0B1C2D3..., the first output is from Producer1, and the second output is from Producer2, and the third output is from Producer1, and the 4th output is from Producer2, and repeat.

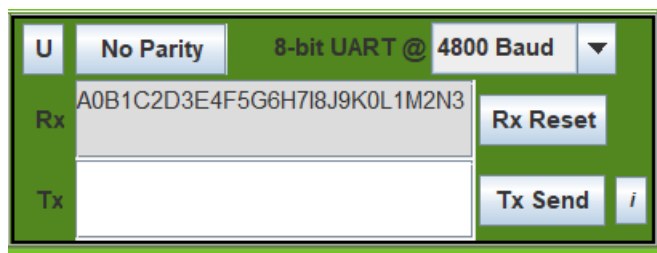
What kinds of output pattern do you consider to be fair?

I think the output pattern A0B1C2D3... is fair.

Does your code have the problem of starvation?

No, my code does not have the problem of starvation.

Propose your own solution to make it fair for these threads. Explain the changes that you made.



I add a variable “turn” in my code.

I initiate “turn” to be 1.

When “turn” is 1, I let Producer1 can add one item into buffer and also make “turn” become 0.

When “turn” is 0, I let Producer2 can add one item into buffer and also make “turn” become 1.

Also, the action of the change of “turn” is in the critical section.

3. Typescript and screenshots

3.1 Typescript for compilation

```

User@LAPTOP-59VRNRON /cygdrive/c/Users/User/Desktop/Home
work/Checkpoint4
$ 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

User@LAPTOP-59VRNRON /cygdrive/c/Users/User/Desktop/Home
work/Checkpoint4
$ make
sdcc -c test3threads.c
test3threads.c:115: warning 158: overflow in implicit co
nstant conversion
sdcc -c preemptive.c
preemptive.c:258: warning 85: in function ThreadCreate u
nreferenced function argument : 'fp'
sdcc -o test3threads.hex test3threads.rel preemptive.re
l

User@LAPTOP-59VRNRON /cygdrive/c/Users/User/Desktop/Home
work/Checkpoint4

```

3.2 Screenshots and explanation

The file “testpreempt.map” shows that the function Producer1 starts from the line 0014, that the function Producer2 starts from the line 0065, and that the function Consumer starts from the line 00B9.

Take screenshots when the Producer1 and Producer2 running and show semaphore changes.

In Producer1 :

When executing DEC 2AH in the line 0023, it decreases the value of empty by one since it is doing SemaphoreWait(empty).

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0x00

0x00 0x00 0x02 0x08 R6 0x00 ACC 0x03

RXD TXD TMOD 0x20 R5 0x00 PSW 0x10

1 1 SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

pins bits TH1 TL1 R3 0x00 IE 0x82

0xFF 0xFF P3 0xFA 0xFA R2 0x00 PCON 0x00

0xFF 0xFF P2 PC 8051 R1 0x00 DPH 0x00

0xFF 0xFF P1 0x0023 i PSW 0 0 0 1 0 0 0 0

0xFF 0xFF P0

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	56	01	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	03	6F	51	00	00	00	01	41	01	00	03	00	00	00	01	00
30	3F	56	66	76	0E	02	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	14	00	00	00	00	00	11	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Time: 8ms 988us - Instructions: 4165

0023* DEC 2AH

0025I MOV 0E0H,28H

0028I JZ 0FBH

002AI JB 0E7H,0F8H

002D* DEC 28H

002FI MOV 2EH,#00H

0032I MOV A,2BH

0034I ADD A,#23H

0036I MOV R0,A

0037I MOV @R0,27H

0039I MOV R6,2BH

003BI MOV R7,#00H

003DI MOV 82H,R6

003FI MOV 83H,R7

0041I INC DPTR

0042I MOV 08H,#03H

0045I MOV 09H,R7

0047I LCALL 0417H

004AI MOV R6,82H

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0x00

0x00 0x00 0x02 0x09 R6 0x00 ACC 0x03

RXD TXD TMOD 0x20 R5 0x00 PSW 0x10

1 1 SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

pins bits TH1 TL1 R3 0x00 IE 0x82

0xFF 0xFF P3 0xFA 0xFB R2 0x00 PCON 0x00

0xFF 0xFF P2 PC 8051 R1 0x00 DPH 0x00

0xFF 0xFF P1 0x0025 i PSW 0 0 0 1 0 0 0 0

0xFF 0xFF P0

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	56	01	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	03	6F	51	00	00	00	01	41	01	00	02	00	00	00	01	00
30	3F	56	66	76	0E	02	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	14	00	00	00	00	00	11	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Executed 0x0023: DEC 2AH | Time: 8ms 989us - Instru

0023* DEC 2AH

0025I MOV 0E0H,28H

0028I JZ 0FBH

002AI JB 0E7H,0F8H

002D* DEC 28H

002FI MOV 2EH,#00H

0032I MOV A,2BH

0034I ADD A,#23H

0036I MOV R0,A

0037I MOV @R0,27H

0039I MOV R6,2BH

003BI MOV R7,#00H

003DI MOV 82H,R6

003FI MOV 83H,R7

0041I INC DPTR

0042I MOV 08H,#03H

0045I MOV 09H,R7

0047I LCALL 0417H

004AI MOV R6,82H

When executing DEC 28H in the line 002D, it decreases the value of mutex by one since it is doing SemaphoreWait(mutex).

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O	W/O	TH0	TL0	R7	0x00	B	0x00
0x00	0x00	0x02	0x0F	R6	0x00	ACC	0x01
RXD	TXD			R5	0x00	PSW	0x11
1	1	TMOD	0x20	R4	0x00	IP	0x00
SCON	0x50	TCON	0xD0	R3	0x00	IE	0x82
				R2	0x00	PCON	0x00
pins	bits	TH1	TL1	R1	0x00	DPH	0x00
0xFF	0xFF	P3	0xFA	0xFB	R0	DPL	0x00
0xFF	0xFF	P2				SP	0x5F
0xFF	0xFF	P1					
0xFF	0xFF	P0					

PC

0x002D

8051

PSW

0 0 0 1 0 0 0 1

Modify RAM

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	56	01	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	03	6F	51	00	00	00	01	41	01	00	02	00	00	00	01	00
30	3F	56	66	76	0E	02	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	14	00	00	00	00	00	11	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Time: 8ms 995us - Instructions: 4169

0023*	DEC 2AH
0025I	MOV 0E0H,28H
0028I	JZ 0FBH
002AI	JB 0E7H,0F8H
002D*	DEC 28H
002FI	MOV 2EH,#00H
0032I	MOV A,2BH
0034I	ADD A,#23H
0036I	MOV R0,A
0037I	MOV @R0,27H
0039I	MOV R6,2BH
003BI	MOV R7,#00H
003DI	MOV 82H,R6
003FI	MOV 83H,R7
0041I	INC DPTR
0042I	MOV 08H,#03H
0045I	MOV 09H,R7
0047I	LCALL 0417H
004AI	MOV R6,82H

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O	W/O	TH0	TL0	R7	0x00	B	0x00
0x00	0x00	0x02	0x10	R6	0x00	ACC	0x01
RXD	TXD			R5	0x00	PSW	0x11
1	1	TMOD	0x20	R4	0x00	IP	0x00
SCON	0x50	TCON	0xD0	R3	0x00	IE	0x82
				R2	0x00	PCON	0x00
pins	bits	TH1	TL1	R1	0x00	DPH	0x00
0xFF	0xFF	P3	0xFA	0xFC	R0	DPL	0x00
0xFF	0xFF	P2				SP	0x5F
0xFF	0xFF	P1					
0xFF	0xFF	P0					

PC

0x002F

8051

PSW

0 0 0 1 0 0 0 1

Modify RAM

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	56	01	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	03	6F	51	00	00	00	01	41	00	00	02	00	00	00	01	00
30	3F	56	66	76	0E	02	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	14	00	00	00	00	00	11	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Executed 0x002D: DEC 28H | Time: 8ms 996us - Instru

0023*	DEC 2AH
0025I	MOV 0E0H,28H
0028I	JZ 0FBH
002AI	JB 0E7H,0F8H
002D*	DEC 28H
002FI	MOV 2EH,#00H
0032I	MOV A,2BH
0034I	ADD A,#23H
0036I	MOV R0,A
0037I	MOV @R0,27H
0039I	MOV R6,2BH
003BI	MOV R7,#00H
003DI	MOV 82H,R6
003FI	MOV 83H,R7
0041I	INC DPTR
0042I	MOV 08H,#03H
0045I	MOV 09H,R7
0047I	LCALL 0417H
004AI	MOV R6,82H

When executing INC 28H in the line 005F, it increases the value of mutex by one since it is doing SemaphoreSignal(mutex).

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0xFE

0x00 0x00 0x05 0x0B R6 0x01 ACC 0x42

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x50

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

R3 0x00 IE 0x82

R2 0x00 PCON 0x00

R1 0x00 DPH 0x00

R0 0x23 DPL 0x01

SP 0x5F

pins bits TH1 TL1

0xFF 0xFF P3 0xFA 0xFD

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

PC 0x005F

PSW 0 1 0 1 0 0 0 0

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	00	00	00	00	00	00	00	00
20	03	6F	51	41	00	00	01	42	00	00	02	01	00	00	00	00
30	3F	56	66	76	0E	02	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	08	00	00	00	00	00	00	00	00	00	00
60	4A	00	3E	04	00	00	11	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

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RST Step Run New Load Save Copy Paste

Time: 9ms 95us - Instructions: 4238

0039I MOV R6,2BH

003BI MOV R7,#00H

003DI MOV 82H,R6

003FI MOV 83H,R7

0041I INC DPTR

0042I MOV 08H,#03H

0045I MOV 09H,R7

0047I LCALL 0417H

004AI MOV R6,82H

004CI MOV R7,83H

004EI MOV 2BH,R6

0050I MOV A,#5AH

0052I CJNE A,27H,05H

0055I MOV 27H,#41H

0058I SJMP 05H

005AI MOV A,27H

005CI INC A

005DI MOV 27H,A

005F* INC 28H

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0xFE

0x00 0x00 0x05 0x0C R6 0x01 ACC 0x42

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x50

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

R3 0x00 IE 0x82

R2 0x00 PCON 0x00

R1 0x00 DPH 0x00

R0 0x23 DPL 0x01

SP 0x5F

pins bits TH1 TL1

0xFF 0xFF P3 0xFA 0xFE

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

PC 0x0061

PSW 0 1 0 1 0 0 0 0

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	00	00	00	00	00	00	00	00
20	03	6F	51	41	00	00	01	42	01	00	02	01	00	00	00	00
30	3F	56	66	76	0E	02	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	08	00	00	00	00	00	00	00	00	00	00
60	4A	00	3E	04	00	00	11	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

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RST Step Run New Load Save Copy Paste

Executed 0x005F: INC 28H | Time: 9ms 96us - Instruc

003BI MOV R7,#00H

003DI MOV 82H,R6

003FI MOV 83H,R7

0041I INC DPTR

0042I MOV 08H,#03H

0045I MOV 09H,R7

0047I LCALL 0417H

004AI MOV R6,82H

004CI MOV R7,83H

004EI MOV 2BH,R6

0050I MOV A,#5AH

0052I CJNE A,27H,05H

0055I MOV 27H,#41H

0058I SJMP 05H

005AI MOV A,27H

005CI INC A

005DI MOV 27H,A

005F* INC 28H

0061* INC 29H

When executing INC 29H in the line 0061, it increases the value of full by one since it is doing SemaphoreSignal(full).

System Clock (MHz) 11.0592 1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0xFE

0x00 0x00 0x05 0x0C R6 0x01 ACC 0x42

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x50

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

R3 0x00 IE 0x82

R2 0x00 PCON 0x00

R1 0x00 DPH 0x00

R0 0x23 DPL 0x01

SP 0x5F

pins bits TH1 TL1

0xFF 0xFF P3 0xFA 0xFE

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

PC 0x0061

PSW 0 1 0 1 0 0 0 0

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	00	01	00	00	00	00	00	00	00	00
20	03	6F	51	41	00	00	01	42	01	00	02	01	00	00	00	00
30	3F	56	66	76	0E	02	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	4A	00	3E	04	00	00	11	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	19	00	00	00	00	00	00	00	00	00	00

RST Step Run New Load Save Copy Paste

Executed 0x005F: INC 28H | Time: 9ms 96us - Instruc

003B MOV R7,#00H

003D MOV 82H,R6

003F MOV 83H,R7

0041 INC DPTR

0042 MOV 08H,#03H

0045 MOV 09H,R7

0047 LCALL 0417H

004A MOV R6,82H

004C MOV R7,83H

004E MOV 2BH,R6

0050 MOV A,#5AH

0052 CJNE A,27H,05H

0055 MOV 27H,#41H

0058 SJMP 05H

005A MOV A,27H

005C INC A

005D MOV 27H,A

005F* INC 28H

0061* INC 29H

System Clock (MHz) 11.0592 1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0xFE

0x00 0x00 0x05 0x0D R6 0x01 ACC 0x42

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x50

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

R3 0x00 IE 0x82

R2 0x00 PCON 0x00

R1 0x00 DPH 0x00

R0 0x23 DPL 0x01

SP 0x5F

pins bits TH1 TL1

0xFF 0xFF P3 0xFA 0xFF

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

PC 0x0063

PSW 0 1 0 1 0 0 0 0

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	00	00	00	00	00	00	00	00
20	03	6F	51	41	00	00	01	42	01	01	02	01	00	00	00	00
30	3F	56	66	76	0E	02	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	4A	00	3E	04	00	00	11	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	19	00	00	00	00	00	00	00	00	00	00

RST Step Run New Load Save Copy Paste

Executed 0x0061: INC 29H | Time: 9ms 97us - Instruc

003D MOV 82H,R6

003F MOV 83H,R7

0041 INC DPTR

0042 MOV 08H,#03H

0045 MOV 09H,R7

0047 LCALL 0417H

004A MOV R6,82H

004C MOV R7,83H

004E MOV 2BH,R6

0050 MOV A,#5AH

0052 CJNE A,27H,05H

0055 MOV 27H,#41H

0058 SJMP 05H

005A MOV A,27H

005C INC A

005D MOV 27H,A

005F* INC 28H

0061* INC 29H

0063 SJMP 0B2H

In Producer2 :

When executing DEC 2AH in the line 0077, it decreases the value of empty by one since it is doing SemaphoreWait(empty).

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0

0x00 0x00 0x02 0x0C

RXD TXD

1 1

SCON 0x50

TMOD 0x20

TCON 0xD0

pins bits

0xFF 0xFF P3

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

TH1 TL1

0xFA 0xFA

PC

0x0077

8051

PSW 0 0 0 1 1 0 0 1

Modify RAM

addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	00	00	00	00	00	00	00	00
20	03	6F	51	41	00	00	01	42	01	01	02	01	00	30	00	00
30	3F	56	66	76	0E	03	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Time: 17ms 881us - Instructions: 9630

004E MOV 2BH,R6

0050 MOV A,#5AH

0052 CJNE A,27H,05H

0055 MOV 27H,#41H

0058 SJMP 05H

005A MOV A,27H

005C INC A

005D MOV 27H,A

005F* INC 28H

0061* INC 29H

0063 SJMP 0B2H

0065 MOV 2DH,#30H

0068 MOV A,#01H

006A CJNE A,2EH,02H

006D SJMP 0F9H

006F MOV 0E0H,2AH

0072 JZ 0FBH

0074 JB 0E7H,0F8H

0077* DEC 2AH

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0

0x00 0x00 0x02 0x0D

RXD TXD

1 1

SCON 0x50

TMOD 0x20

TCON 0xD0

pins bits

0xFF 0xFF P3

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

TH1 TL1

0xFA 0xFB

PC

0x0079

8051

PSW 0 0 0 1 1 0 0 1

Modify RAM

addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	00	00	00	00	00	00	00	00
20	03	6F	51	41	00	00	01	42	01	01	01	01	00	30	00	00
30	3F	56	66	76	0E	03	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Executed 0x0077: DEC 2AH | Time: 17ms 882us - Instr

0050 MOV A,#5AH

0052 CJNE A,27H,05H

0055 MOV 27H,#41H

0058 SJMP 05H

005A MOV A,27H

005C INC A

005D MOV 27H,A

005F* INC 28H

0061* INC 29H

0063 SJMP 0B2H

0065 MOV 2DH,#30H

0068 MOV A,#01H

006A CJNE A,2EH,02H

006D SJMP 0F9H

006F MOV 0E0H,2AH

0072 JZ 0FBH

0074 JB 0E7H,0F8H

0077* DEC 2AH

0079 MOV 0E0H,28H

When executing DEC 28H in the line 0081, it decreases the value of mutex by one since it is doing SemaphoreWait(mutex).

System Clock (MHz) 11.0592
1000
Update Freq.

R/O
W/O
TH0
TL0
R7
0x00
B
0x00

0x00
0x00
0x02
0x13
R6
0x00
ACC
0x01

RDX
TXD
TMOD
0x20
R5
0x00
PSW
0x19

1
1
TCON
0xD0
R4
0x00
IP
0x00

SCON
0x50
PINS
bits
TH1
TL1
R3
0x00
IE
0x82

0xFF
0xFF
P3
0xFA
0xFB
R2
0x00
PCON
0x00

0xFF
0xFF
P2
PC
8051
DPH
0x00

0xFF
0xFF
P1
0x0081
R1
0x00
DPL
0x00

0xFF
0xFF
P0
PSW
0
0
0
1
1
0
0
1

Modify RAM
Data Memory
addr
0x00
0x00
value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	00	00	00	00	00	00	00	00
20	03	6F	51	41	00	00	01	42	01	01	01	01	00	30	00	00
30	3F	56	66	76	0E	03	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

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Remove All Breakpoints

RST Step Run New Load Save Copy Paste
Time: 17ms 888us - Instructions: 9634

```

0058I SJMP 05H
005AI MOV A,27H
005CI INC A
005DI MOV 27H,A
005F* INC 28H
0061* INC 29H
0063I SJMP 0B2H
0065I MOV 2DH,#30H
0068I MOV A,#01H
006AI CJNE A,2EH,02H
006DI SJMP 0F9H
006FI MOV 0E0H,2AH
0072I JZ 0FBH
0074I JB 0E7H,0F8H
0077* DEC 2AH
0079I MOV 0E0H,28H
007CI JZ 0FBH
007EI JB 0E7H,0F8H
0081* DEC 28H

```

System Clock (MHz) 11.0592
1000
Update Freq.

R/O
W/O
TH0
TL0
R7
0x00
B
0x00

0x00
0x00
0x02
0x14
R6
0x00
ACC
0x01

RDX
TXD
TMOD
0x20
R5
0x00
PSW
0x19

1
1
TCON
0xD0
R4
0x00
IP
0x00

SCON
0x50
PINS
bits
TH1
TL1
R3
0x00
IE
0x82

0xFF
0xFF
P3
0xFA
0xFC
R2
0x00
PCON
0x00

0xFF
0xFF
P2
PC
8051
DPH
0x00

0xFF
0xFF
P1
0x0083
R1
0x00
DPL
0x00

0xFF
0xFF
P0
PSW
0
0
0
1
1
0
0
1

Modify RAM
Data Memory
addr
0x00
0x00
value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	00	00	00	00	00	00	00	00
20	03	6F	51	41	00	00	01	42	00	01	01	01	00	30	00	00
30	3F	56	66	76	0E	03	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	65	00	00	00	00	00	19	00	00	00	00	00	00	00	00	00

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Remove All Breakpoints

RST Step Run New Load Save Copy Paste
Executed 0x0081: DEC 28H | Time: 17ms 890us - Instr

```

005AI MOV A,27H
005CI INC A
005DI MOV 27H,A
005F* INC 28H
0061* INC 29H
0063I SJMP 0B2H
0065I MOV 2DH,#30H
0068I MOV A,#01H
006AI CJNE A,2EH,02H
006DI SJMP 0F9H
006FI MOV 0E0H,2AH
0072I JZ 0FBH
0074I JB 0E7H,0F8H
0077* DEC 2AH
0079I MOV 0E0H,28H
007CI JZ 0FBH
007EI JB 0E7H,0F8H
0081* DEC 28H
0083I MOV 2EH,#01H

```

When executing INC 28H in the line 00B3, it increases the value of mutex by one since it is doing SemaphoreSignal(mutex).

System Clock (MHz) 11.0592 1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0xFF

0x00 0x00 0x05 0x0F R6 0x02 ACC 0x31

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x59

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

pins bits TH1 TL1 R3 0x00 IE 0x82

0xFF 0xFF P3 0xFA 0xFD R2 0x00 PCON 0x00

0xFF 0xFF P2 PC 8051 DPH 0x00

0xFF 0xFF P1 0x00B3 PSW 0 1 0 1 1 0 0 1

0xFF 0xFF P0 0x00B3

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	24	00	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	00	01	01	02	00	31	01	00
30	3F	56	66	76	0E	03	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	9E	00	3E	04	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Time: 17ms 988us - Instructions: 9703

008DI MOV R6,2BH

008FI MOV R7,#00H

0091I MOV 82H,R6

0093I MOV 83H,R7

0095I INC DPTR

0096I MOV 08H,#03H

0099I MOV 09H,R7

009BI LCALL 0417H

009EI MOV R6,82H

00A0I MOV R7,83H

00A2I MOV 2BH,R6

00A4I MOV A,#39H

00A6I CJNE A,2DH,05H

00A9I MOV 2DH,#30H

00ACI SJMP 05H

00AEI MOV A,2DH

00B0I INC A

00B2I MOV 2DH,A

00B3* INC 28H

System Clock (MHz) 11.0592 1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0xFF

0x00 0x00 0x05 0x10 R6 0x02 ACC 0x31

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x59

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

pins bits TH1 TL1 R3 0x00 IE 0x82

0xFF 0xFF P3 0xFA 0xFE R2 0x00 PCON 0x00

0xFF 0xFF P2 PC 8051 DPH 0x00

0xFF 0xFF P1 0x00B5 PSW 0 1 0 1 1 0 0 1

0xFF 0xFF P0 0x00B5

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	24	00	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	01	01	01	02	00	31	01	00
30	3F	56	66	76	0E	03	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	9E	00	3E	04	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Executed 0x00B3: INC 28H | Time: 17ms 989us - Instr

008FI MOV R7,#00H

0091I MOV 82H,R6

0093I MOV 83H,R7

0095I INC DPTR

0096I MOV 08H,#03H

0099I MOV 09H,R7

009BI LCALL 0417H

009EI MOV R6,82H

00A0I MOV R7,83H

00A2I MOV 2BH,R6

00A4I MOV A,#39H

00A6I CJNE A,2DH,05H

00A9I MOV 2DH,#30H

00ACI SJMP 05H

00AEI MOV A,2DH

00B0I INC A

00B2I MOV 2DH,A

00B3* INC 28H

00B5* INC 29H

When executing INC 29H in the line 00B5, it increases the value of full by one since it is doing SemaphoreSignal(full).

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0

0x00 0x00 0x05 0x10

R7 R6 R5 R4 R3 R2 R1 R0

0x00 0x02 0x00 0x00 0x00 0x00 0x00 0x24

B ACC PSW IP IE PCON DPH DPL SP

0xFF 0x31 0x59 0x00 0x82 0x00 0x00 0x02 0x6F

TMOD TCON

0x20 0xD0

pins bits

0xFF 0xFF P3 0xFF 0xFF P2 0xFF 0xFF P1 0xFF 0xFF P0

TH1 TL1

0xFA 0xFE

PC

0x00B5

PSW

0 1 0 1 1 0 0 1

Modify RAM

addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	00	01	00	24	00	00	00	00	00	02
20	03	6F	51	41	30	00	01	42	01	01	01	02	00	31	01	00
30	3F	56	66	76	0E	03	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	9E	00	3E	04	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0

0x00 0x00 0x05 0x11

R7 R6 R5 R4 R3 R2 R1 R0

0x00 0x02 0x00 0x00 0x00 0x00 0x00 0x24

B ACC PSW IP IE PCON DPH DPL SP

0xFF 0x31 0x59 0x00 0x82 0x00 0x00 0x02 0x6F

TMOD TCON

0x20 0xD0

pins bits

0xFF 0xFF P3 0xFF 0xFF P2 0xFF 0xFF P1 0xFF 0xFF P0

TH1 TL1

0xFA 0xFF

PC

0x00B7

PSW

0 1 0 1 1 0 0 1

Modify RAM

addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	00	01	00	24	00	00	00	00	00	02
20	03	6F	51	41	30	00	01	42	01	02	01	02	00	31	01	00
30	3F	56	66	76	0E	03	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	9E	00	3E	04	00	00	19	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Executed 0x00B3: INC 28H | Time: 17ms 989us - Instr

008FH MOV R7,#00H

0091H MOV 82H,R6

0093H MOV 83H,R7

0095H INC DPTR

0096H MOV 08H,#03H

0099H MOV 09H,R7

009BH LCALL 0417H

009EH MOV R6,82H

00A0H MOV R7,83H

00A2H MOV 2BH,R6

00A4H MOV A,#39H

00A6H CJNE A,2DH,05H

00A9H MOV 2DH,#30H

00ACH SJMP 05H

00AEH MOV A,2DH

00B0H INC A

00B1H MOV 2DH,A

00B3* INC 28H

00B5* INC 29H

RST Step Run New Load Save Copy Paste

Executed 0x00B5: INC 29H | Time: 17ms 990us - Instr

0091H MOV 82H,R6

0093H MOV 83H,R7

0095H INC DPTR

0096H MOV 08H,#03H

0099H MOV 09H,R7

009BH LCALL 0417H

009EH MOV R6,82H

00A0H MOV R7,83H

00A2H MOV 2BH,R6

00A4H MOV A,#39H

00A6H CJNE A,2DH,05H

00A9H MOV 2DH,#30H

00ACH SJMP 05H

00AEH MOV A,2DH

00B0H INC A

00B1H MOV 2DH,A

00B3* INC 28H

00B5* INC 29H

00B7H SJMP 0AFH

Take screenshots when the Consumer is running and show semaphore changes.

When executing DEC 29H in the line 00CC, it decreases the value of full by one since it is doing SemaphoreWait(full).

System Clock (MHz) 11.0592 1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0x00

0x00 0x00 0x02 0x04 R6 0x00 ACC 0x02

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x09

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

pins bits TH1 TL1 R3 0x00 IE 0x82

0xFF 0xFF P3 0xFA 0xFA R2 0x00 PCON 0x00

0xFF 0xFF P2 0xFA 0xFA R1 0x00 DPH 0x00

0xFF 0xFF P1 0x00CC PC 8051 R0 0x01 DPL 0x03

0xFF 0xFF P0 PSW 0 0 0 0 1 0 0 1 SP 0x4F

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	00	01	00	24	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	01	02	01	02	00	31	01	00
30	3F	56	66	76	0E	01	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	6D	00	01	FF	02	00	59	00	00	00	00	00	00	00	00	00

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RST Step Run New Load Save Copy Paste

Time: 26ms 761us - Instructions: 14553

00A21 MOV 2BH,R6

00A41 MOV A,#39H

00A61 CJNE A,2DH,05H

00A91 MOV 2DH,#30H

00AC1 SJMP 05H

00AE1 MOV A,2DH

00B01 INC A

00B11 MOV 2DH,A

00B3* INC 28H

00B5* INC 29H

00B71 SJMP 0AFH

00B91 ORL 89H,#20H

00BC1 MOV 8DH,#0FAH

00BF1 MOV 98H,#50H

00C21 SETB 8EH

00C41 MOV 0E0H,29H

00C71 JZ 0FBH

00C91 JB 0E7H,0F8H

00CC* DEC 29H

System Clock (MHz) 11.0592 1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0x00

0x00 0x00 0x02 0x05 R6 0x00 ACC 0x02

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x09

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

pins bits TH1 TL1 R3 0x00 IE 0x82

0xFF 0xFF P3 0xFA 0xFB R2 0x00 PCON 0x00

0xFF 0xFF P2 0xFA 0xFB R1 0x00 DPH 0x00

0xFF 0xFF P1 0x00CE PC 8051 R0 0x01 DPL 0x03

0xFF 0xFF P0 PSW 0 0 0 0 1 0 0 1 SP 0x4F

Modify RAM

Data Memory

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	24	00	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	01	01	01	02	00	31	01	00
30	3F	56	66	76	0E	01	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	6D	00	01	FF	02	00	59	00	00	00	00	00	00	00	00	00

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RST Step Run New Load Save Copy Paste

Executed 0x00CC: DEC 29H | Time: 26ms 762us - Instr

00A41 MOV A,#39H

00A61 CJNE A,2DH,05H

00A91 MOV 2DH,#30H

00AC1 SJMP 05H

00AE1 MOV A,2DH

00B01 INC A

00B11 MOV 2DH,A

00B3* INC 28H

00B5* INC 29H

00B71 SJMP 0AFH

00B91 ORL 89H,#20H

00BC1 MOV 8DH,#0FAH

00BF1 MOV 98H,#50H

00C21 SETB 8EH

00C41 MOV 0E0H,29H

00C71 JZ 0FBH

00C91 JB 0E7H,0F8H

00CC* DEC 29H

00CE1 MOV 0E0H,28H

When executing DEC 28H in the line 00D6, it decreases the value of mutex by one since it is doing SemaphoreWait(mutex).

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0x00

0x00 0x00 0x02 0x0B R6 0x00 ACC 0x01

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x09

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

pins bits TH1 TL1 R3 0x00 IE 0x82

0xFF 0xFF P3 0xFA 0xFB R2 0x00 PCON 0x00

0xFF 0xFF P2 PC 8051 R1 0x00 DPH 0x00

0xFF 0xFF P1 PSW 0 0 0 0 1 0 0 1 R0 0x01 DPL 0x03

0xFF 0xFF P0 0x00D6 SP 0x4F

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	24	00	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	01	01	01	02	00	31	01	00
30	3F	56	66	76	0E	01	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	6D	00	01	FF	02	00	59	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Time: 26ms 769us - Instructions: 14557

00ACI SJMP 05H

00AEI MOV A,2DH

00B0I INC A

00B1I MOV 2DH,A

00B3* INC 28H

00B5* INC 29H

00B7I SJMP 0AFH

00B9I ORL 89H,#20H

00BCI MOV 8DH,#0FAH

00BFI MOV 98H,#50H

00C2I SETB 8EH

00C4I MOV 0E0H,29H

00C7I JZ 0FBH

00C9I JB 0E7H,0F8H

00CC* DEC 29H

00CEI MOV 0E0H,28H

00D1I JZ 0FBH

00D3I JB 0E7H,0F8H

00D6* DEC 28H

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0x00

0x00 0x00 0x02 0x0C R6 0x00 ACC 0x01

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0x09

SCON 0x50 TCON 0xD0 R4 0x00 IP 0x00

pins bits TH1 TL1 R3 0x00 IE 0x82

0xFF 0xFF P3 0xFA 0xFC R2 0x00 PCON 0x00

0xFF 0xFF P2 PC 8051 R1 0x00 DPH 0x00

0xFF 0xFF P1 PSW 0 0 0 0 1 0 0 1 R0 0x01 DPL 0x03

0xFF 0xFF P0 0x00D8 SP 0x4F

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	00	00
10	23	00	00	00	00	00	01	00	24	00	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	00	01	01	02	00	31	01	00
30	3F	56	66	76	0E	01	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	C7	00	00	00	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	6D	00	01	FF	02	00	59	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Executed 0x00D6: DEC 28H | Time: 26ms 770us - Instr

00AEI MOV A,2DH

00B0I INC A

00B1I MOV 2DH,A

00B3* INC 28H

00B5* INC 29H

00B7I SJMP 0AFH

00B9I ORL 89H,#20H

00BCI MOV 8DH,#0FAH

00BFI MOV 98H,#50H

00C2I SETB 8EH

00C4I MOV 0E0H,29H

00C7I JZ 0FBH

00C9I JB 0E7H,0F8H

00CC* DEC 29H

00CEI MOV 0E0H,28H

00D1I JZ 0FBH

00D3I JB 0E7H,0F8H

00D6* DEC 28H

00D8I MOV A,2CH

When executing INC 28H in the line 00FB, it increases the value of mutex by one since it is doing SemaphoreSignal(mutex).

System Clock (MHz) 11.0592 1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0xFE

0x00 0x41 0x38 0x11 R6 0x01 ACC 0x01

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0xC9

1 1 TCON 0xD0 R4 0x00 IP 0x00

SCON 0x50 R3 0x00 IE 0x82

R2 0x00 PCON 0x00

R1 0x00 DPH 0x00

R0 0x01 DPL 0x01

SP 0x4F

pins bits TH1 TL1

0xFF 0xFF P3 0xFA 0xFB

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

PC 0x00FB

PSW 1 1 0 0 1 0 0 1

Modify RAM

addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	01	00
10	23	00	00	00	00	00	01	00	24	00	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	00	01	01	02	01	31	01	00
30	3F	56	66	76	0E	01	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	F0	00	3E	04	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	6D	00	01	FF	02	00	59	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Time: 28ms 650us - Instructions: 15445

00D6* DEC 28H

00D8 MOV A,2CH

00DAI ADD A,#23H

00DCI MOV R1,A

00DDI MOV 99H,@R1

00DFI MOV R6,2CH

00E1I MOV R7,#00H

00E3I MOV 82H,R6

00E5I MOV 83H,R7

00E7I INC DPTR

00E8I MOV 08H,#03H

00EBI MOV 09H,R7

00EDI LCALL 0417H

00F0I MOV R6,82H

00F2I MOV R7,83H

00F4I MOV 2CH,R6

00F6I JBC 99H,02H

00F9I SJMP 0FBH

00FB* INC 28H

System Clock (MHz) 11.0592 1000 Update Freq.

SBUF

R/O W/O TH0 TL0 R7 0x00 B 0xFE

0x00 0x41 0x38 0x12 R6 0x01 ACC 0x01

RXD TXD 1 1 TMOD 0x20 R5 0x00 PSW 0xC9

1 1 TCON 0xD0 R4 0x00 IP 0x00

SCON 0x50 R3 0x00 IE 0x82

R2 0x00 PCON 0x00

R1 0x00 DPH 0x00

R0 0x01 DPL 0x01

SP 0x4F

pins bits TH1 TL1

0xFF 0xFF P3 0xFA 0xFC

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

PC 0x00FD

PSW 1 1 0 0 1 0 0 1

Modify RAM

addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	01	00
10	23	00	00	00	00	00	01	00	24	00	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	01	01	01	02	01	31	01	00
30	3F	56	66	76	0E	01	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	F0	00	3E	04	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	6D	00	01	FF	02	00	59	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Executed 0x00FB: INC 28H | Time: 28ms 651us - Instr

00D8 MOV A,2CH

00DAI ADD A,#23H

00DCI MOV R1,A

00DDI MOV 99H,@R1

00DFI MOV R6,2CH

00E1I MOV R7,#00H

00E3I MOV 82H,R6

00E5I MOV 83H,R7

00E7I INC DPTR

00E8I MOV 08H,#03H

00EBI MOV 09H,R7

00EDI LCALL 0417H

00F0I MOV R6,82H

00F2I MOV R7,83H

00F4I MOV 2CH,R6

00F6I JBC 99H,02H

00F9I SJMP 0FBH

00FB* INC 28H

00FD* INC 2AH

When executing INC 2AH in the line 00FD, it increases the value of empty by one since it is doing SemaphoreSignal(empty).

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O

0x00 0x41

TH0 TL0

0x38 0x12

R7 0x00

B 0xFE

R6 0x01

ACC 0x01

R5 0x00

PSW 0xC9

R4 0x00

IP 0x00

R3 0x00

IE 0x82

R2 0x00

PCON 0x00

R1 0x00

DPH 0x00

R0 0x01

DPL 0x01

SP 0x4F

pins bits

0xFF 0xFF P3

TH1 TL1

0xFA 0xFC

PC

0x00FD

PSW

1 1 0 0 1 0 0 1

Modify RAM

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	01	00
10	23	00	00	00	00	00	00	01	00	24	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	01	01	01	02	01	31	01	00
30	3F	56	66	76	0E	01	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	F0	00	3E	04	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	6D	00	01	FF	02	00	59	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

Executed 0x00FB: INC 28H | Time: 28ms 651us - Instr

00D8I MOV A,2CH

00DAI ADD A,#23H

00DCI MOV R1,A

00DDI MOV 99H,@R1

00DFI MOV R6,2CH

00E1I MOV R7,#00H

00E3I MOV 82H,R6

00E5I MOV 83H,R7

00E7I INC DPTR

00E8I MOV 08H,#03H

00EBI MOV 09H,R7

00EDI LCALL 0417H

00F0I MOV R6,82H

00F2I MOV R7,83H

00F4I MOV 2CH,R6

00F6I JBC 99H,02H

00F9I SJMP 0FBH

00FB* INC 28H

00FD* INC 2AH

System Clock (MHz) 11.0592

1000 Update Freq.

SBUF

R/O W/O

0x00 0x41

TH0 TL0

0x38 0x13

R7 0x00

B 0xFE

R6 0x01

ACC 0x01

R5 0x00

PSW 0xC9

R4 0x00

IP 0x00

R3 0x00

IE 0x82

R2 0x00

PCON 0x00

R1 0x00

DPH 0x00

R0 0x01

DPL 0x01

SP 0x4F

pins bits

0xFF 0xFF P3

TH1 TL1

0xFA 0xFD

PC

0x00FF

PSW

1 1 0 0 1 0 0 1

Modify RAM

addr 0x00 0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	01	00	00	00	00	00	01	00
10	23	00	00	00	00	00	01	00	24	00	00	00	00	00	02	00
20	03	6F	51	41	30	00	01	42	01	01	02	02	01	31	01	00
30	3F	56	66	76	0E	01	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	F0	00	3E	04	03	00	08	00	00	00	00	00	00	00	00	00
60	19	00	00	FE	01	00	50	00	00	00	00	00	00	00	00	00
70	6D	00	01	FF	02	00	59	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

Executed 0x00FD: INC 2AH | Time: 28ms 652us - Instr

00DAI ADD A,#23H

00DCI MOV R1,A

00DDI MOV 99H,@R1

00DFI MOV R6,2CH

00E1I MOV R7,#00H

00E3I MOV 82H,R6

00E5I MOV 83H,R7

00E7I INC DPTR

00E8I MOV 08H,#03H

00EBI MOV 09H,R7

00EDI LCALL 0417H

00F0I MOV R6,82H

00F2I MOV R7,83H

00F4I MOV 2CH,R6

00F6I JBC 99H,02H

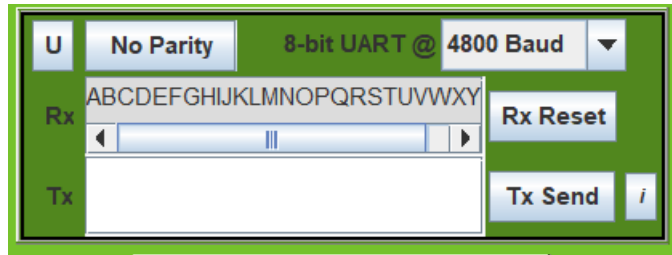
00F9I SJMP 0FBH

00FB* INC 28H

00FD* INC 2AH

00FFI SJMP 0C3H

Show and explain UART output to show the unfair version, if any, and the fair version.
The unfair version :



The reason why causes the unfair reason is that the variable “empty” changes from 3 to 0 in the Producer1, and changes from 0 to 3 in the Consumer. Thus, the Producer2 cannot add its item into buffer since it executes the line “SemaphoreWait(empty);” repeatedly.

In the fair version, I solve this problem by giving each Producer one time to add its item to the buffer.

The fair version :

