

Lab4  
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### Q3.3

Discuss your findings in Lab4Answers.pdf. Describe in your write-up how you are handling the NULL process under TS scheduling so that it is only executed if there are no other ready processes.

Ans:

After my implementation of TS, when running CPU intensive test from priority 50, since higher cpu intensive process gets lower priority every time they depleted they time slice, we can see that their priority decrease as time goes on.(see output at “CPU TEST” on last page, color GREEN.)

After my implementation of TS, when running IO intensive test from priority 10, since lower IO intensive process gets higher priority every time they give up they time slice voluntarily, we can see that their priority increase as time goes on(to 58, since priority 59 is preserved).(see output at “IO TEST” on last page, color BLUE.)

For Mixtest, IO intensive get promoted to higher priority while CPU intensive processes get demoted with lower priority and longer quantum.

I excluded all the null process cases in resched() and let it to be always as priority 0, so that it's priority will not change according to the TS table, thus ensures that when there's only null process, null process get to run, and when there is other process, run other process first (since other process has higher priority)

## Bonus problem (20 pts)

The 60 priority levels used in UNIX Solaris has proven to be effective in real-world deployments, however, that is not to say that fewer priority levels will not work (almost) equally well. As mentioned in class, versions of BSD UNIX and Windows use significantly fewer priority levels and are known to operate well. Modify the UNIX Solaris TS implementation of Problem 3 so that priority levels are reduced from 60 to 20. The code should be the same except for reading 20 rows of values instead of 60 and initializing `xts_conf[]` with different values. Create a new calibration table that follows the same format as [TS](#) but has only 20 priority levels. Change the values of the entries so that the TS scheduling approach we discussed (higher relative priority to I/O-bound processes over CPU-bound processes, opposite for time slice) is

followed. Set the values as you see fit so as to achieve fair sharing of CPU cycles. As in Problem 3, Benchmark the scheduler with the modified scheduling calibration table on the "half-and-half" test case only. Discuss your findings in Lab4Answers.pdf.

Please put the initialization of the Bonus scheduler between `#ifdef BONUS` tags. If `BONUS` is not defined, please initialize the table with the Solaris configuration. When turning in the lab, please do not define `BONUS`.

Ans: New Calibration Table

ts_quantum	ts_tqexp	ts_slpret	PRIORITY
200	0	13	0
200	1	13	1
200	1	13	2
160	1	14	3
160	2	14	4
160	2	14	5
160	3	14	6
120	4	15	7
120	5	15	8
120	6	15	9
80	7	16	10
80	8	16	11
80	9	16	12
80	10	17	13
80	11	17	14
80	12	17	15
40	13	18	16
40	14	18	17
40	15	18	18
20	16	19	19

## CPU TEST OUTPUT:

Test for CPU begins

CPUProcess(3):, outer i: 0, Prio: 50, Preempt: 40,cputot: 1

CPUProcess(3):, outer i: 0, Prio: 50, Preempt: 35,cputot: 1

CPUProcess(3):, outer i: 0, Prio: 50, Preempt: 30,cputot: 1

CPUProcess(3):, outer i: 0, Prio: 50, Preempt: 24,cputot: 1

CPUProcess(3):, outer i: 0, Prio: 50, Preempt: 19,cputot: 1

CPUProcess(3):, outer i: 0, Prio: 50, Preempt: 14,cputot: 1

CPUProcess(3):, outer i: 0, Prio: 50, Preempt: 8,cputot: 1

CPUProcess(3):, outer i: 0, PriCPUProcess(4):, outer i: 0, Prio: 50, Preempt:  
40,cputot: 1

CPUProcess(4):, outer i: 0, Prio: 50, Preempt: 35,cputot: 1

CPUProcess(4):, outer i: 0, Prio: 50, Preempt: 30,cputot: 1

CPUProcess(4):, outer i: 0, Prio: 50, Preempt: 25,cputot: 1

CPUProcess(4):, outer i: 0, Prio: 50, Preempt: 19,cputot: 1

CPUProcess(4):, outer i: 0, Prio: 50, Preempt: 14,cputot: 1

CPUProcess(4):, outer i: 0, Prio: 50, Preempt: 9,cputot: 1

CPUProcess(4):, outer i: 0, Prio:CPUProcess(5):, outer i: 0, Prio: 50, Preempt:  
40,cputot: 1

CPUProcess(5):, outer i: 0, Prio: 50, Preempt: 35,cputot: 1

CPUProcess(5):, outer i: 0, Prio: 50, Preempt: 30,cputot: 1

CPUProcess(5):, outer i: 0, Prio: 50, Preempt: 25,cputot: 1

CPUProcess(5):, outer i: 0, Prio: 50, Preempt: 19,cputot: 1

CPUProcess(5):, outer i: 0, Prio: 50, Preempt: 14,cputot: 1

CPUProcess(5):, outer i: 0, Prio: 50, Preempt: 9,cputot: 1

CPUProcess(5):, outer i: 0, Prio: CPUProcess(6):, outer i: 0, Prio: 50, Preempt: 40,cputot: 1

CPUProcess(6):, outer i: 0, Prio: 50, Preempt: 35,cputot: 1

CPUProcess(6):, outer i: 0, Prio: 50, Preempt: 30,cputot: 1

CPUProcess(6):, outer i: 0, Prio: 50, Preempt: 25,cputot: 1

CPUProcess(6):, outer i: 0, Prio: 50, Preempt: 19,cputot: 1

CPUProcess(6):, outer i: 0, Prio: 50, Preempt: 14,cputot: 1

CPUProcess(6):, outer i: 0, Prio: 50, Preempt: 9,cputot: 1

CPUProcess(6):, outer i: 0, Prio: CPUProcess(7):, outer i: 0, Prio: 50, Preempt: 40,cputot: 1

CPUProcess(7):, outer i: 0, Prio: 50, Preempt: 35,cputot: 1

CPUProcess(7):, outer i: 0, Prio: 50, Preempt: 30,cputot: 1

CPUProcess(7):, outer i: 0, Prio: 50, Preempt: 25,cputot: 1

CPUProcess(7):, outer i: 0, Prio: 50, Preempt: 19,cputot: 1

CPUProcess(7):, outer i: 0, Prio: 50, Preempt: 14,cputot: 1

CPUProcess(7):, outer i: 0, Prio: 50, Preempt: 9,cputot: 1

CPUProcess(7):, outer i: 0, Prio: 50, Preempt: 3,cputot: 1

CPUProcess(3):, outer i: 0, Prio: 40, Preempt: 38,cputot: 41

CPUProcess(3):, outer i: 0, Prio: 40, Preempt: 33,cputot: 41

CPUProcess(3):, outer i: 1, Prio: 40, Preempt: 27,cputot: 41

CPUProcess(3):, outer i: 1, Prio: 40, Preempt: 22,cputot: 41

CPUProcess(3):, outer i: 1, Prio: 40, Preempt: 16,cputot: 41

CPUProcess(3):, outer i: 1, Prio: 40, Preempt: 11,cputot: 41

CPUProcess(3):, outer i: 1, Prio: 40, Preempt: 6,cputot: 41 50, Preempt: 3,cputot: 1

CPUProcess(4):, outer i: 0, Prio: 40, Preempt: 38,cputot: 81

CPUProcess(4):, outer i: 0, Prio: 40, Preempt: 33,cputot: 81

CPUProcess(4):, outer i: 1, Prio: 40, Preempt: 27,cputot: 81

CPUProcess(4):, outer i: 1, Prio: 40, Preempt: 22,cputot: 81

CPUProcess(4):, outer i: 1, Prio: 40, Preempt: 17,cputot: 81

CPUProcess(4):, outer i: 1, Prio: 40, Preempt: 11,cputot: 81

CPUProcess(4):, outer i: 1, Prio: 40, Preempt: 6,cputot: 81

50, Preempt: 3,cputot: 1

CPUProcess(5):, outer i: 0, Prio: 40, Preempt: 38,cputot: 121

CPUProcess(5):, outer i: 0, Prio: 40, Preempt: 33,cputot: 121

CPUProcess(5):, outer i: 1, Prio: 40, Preempt: 27,cputot: 121

CPUProcess(5):, outer i: 1, Prio: 40, Preempt: 22,cputot: 121

CPUProcess(5):, outer i: 1, Prio: 40, Preempt: 16,cputot: 121

CPUProcess(5):, outer i: 1, Prio: 40, Preempt: 11,cputot: 121

CPUProcess(5):, outer i: 1, Prio: 40, Preempt: 5,cputot50, Preempt: 3,cputot: 1

CPUProcess(6):, outer i: 0, Prio: 40, Preempt: 38,cputot: 161

CPUProcess(6):, outer i: 0, Prio: 40, Preempt: 33,cputot: 161

CPUProcess(6):, outer i: 1, Prio: 40, Preempt: 27,cputot: 161

CPUProcess(6):, outer i: 1, Prio: 40, Preempt: 22,cputot: 161

CPUProcess(6):, outer i: 1, Prio: 40, Preempt: 16,cputot: 161  
CPUProcess(6):, outer i: 1, Prio: 40, Preempt: 11,cputot: 161  
CPUProcess(6):, outer i: 1, Prio: 40, Preempt: 5,cputot: 50, Preempt: 3,cputot: 1  
CPUProcess(7):, outer i: 0, Prio: 40, Preempt: 38,cputot: 201  
CPUProcess(7):, outer i: 0, Prio: 40, Preempt: 33,cputot: 201  
CPUProcess(7):, outer i: 1, Prio: 40, Preempt: 27,cputot: 201  
CPUProcess(7):, outer i: 1, Prio: 40, Preempt: 22,cputot: 201  
CPUProcess(7):, outer i: 1, Prio: 40, Preempt: 16,cputot: 201  
CPUProcess(7):, outer i: 1, Prio: 40, Preempt: 11,cputot: 201  
CPUProcess(7):, outer i: 1, Prio: 40, Preempt: 5,cputo  
CPUProcess(3):, outer i: 1, Prio: 30, Preempt: 80,cputot: 81  
CPUProcess(3):, outer i: 1, Prio: 30, Preempt: 75,cputot: 81  
CPUProcess(3):, outer i: 1, Prio: 30, Preempt: 70,cputot: 81  
CPUProcess(3):, outer i: 1, Prio: 30, Preempt: 64,cputot: 81  
CPUProcess(3):, outer i: 1, Prio: 30, Preempt: 59,cputot: 81  
CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 53,cputot: 81  
CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 48,cputot: 81  
CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 43,cputot: 81  
CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 37,cputot: 81  
CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 32,cputot: 81  
CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 26,cputot: 81  
CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 21,cputot: 81

CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 16,cputot: 81

CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 10,cputot: 81

CPUProcess(3):, outer i: 2, Prio: 30, Preempt: 5,cCPUProcess(4):, outer i: 1, Prio: 30, Preempt: 80,cputot: 81

CPUProcess(4):, outer i: 1, Prio: 30, Preempt: 75,cputot: 121

CPUProcess(4):, outer i: 1, Prio: 30, Preempt: 70,cputot: 121

CPUProcess(4):, outer i: 1, Prio: 30, Preempt: 64,cputot: 121

CPUProcess(4):, outer i: 1, Prio: 30, Preempt: 59,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, Preempt: 53,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, Preempt: 48,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, Preempt: 42,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, Preempt: 37,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, Preempt: 31,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, Preempt: 26,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, Preempt: 20,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, Preempt: 15,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, Preempt: 9,cputot: 121

CPUProcess(4):, outer i: 2, Prio: 30, P: 121

CPUProcess(5):, outer i: 1, Prio: 30, Preempt: 80,cputot: 161

CPUProcess(5):, outer i: 1, Prio: 30, Preempt: 74,cputot: 161

CPUProcess(5):, outer i: 1, Prio: 30, Preempt: 69,cputot: 161

CPUProcess(5):, outer i: 1, Prio: 30, Preempt: 64,cputot: 161

CPUProcess(5):, outer i: 1, Prio: 30, Preempt: 58,cputot: 161  
CPUProcess(5):, outer i: 2, Prio: 30, Preempt: 53,cputot: 161  
CPUProcess(5):, outer i: 2, Prio: 30, Preempt: 47,cputot: 161  
CPUProcess(5):, outer i: 2, Prio: 30, Preempt: 42,cputot: 161  
CPUProcess(5):, outer i: 2, Prio: 30, Preempt: 36,cputot: 161  
CPUProcess(5):, outer i: 2, Prio: 30, Preempt: 31,cputot: 161  
CPUProcess(5):, outer i: 2, Prio: 30, Preempt: 25,cputot: 161  
CPUProcess(5):, outer i: 2, Prio: 30, Preempt: 20,cputot: 161  
CPUProcess(5):, outer i: 2, Prio: 30, Preempt: 14,cputot: 161  
CPUProcess(5):, outer i: 2, Prio: 30, Preempt: 9,cputot: 161  
CPUProcess(5):, outer i: 2, Pri 161  
CPUProcess(6):, outer i: 1, Prio: 30, Preempt: 80,cputot: 201  
CPUProcess(6):, outer i: 1, Prio: 30, Preempt: 75,cputot: 201  
CPUProcess(6):, outer i: 1, Prio: 30, Preempt: 69,cputot: 201  
CPUProcess(6):, outer i: 1, Prio: 30, Preempt: 64,cputot: 201  
CPUProcess(6):, outer i: 1, Prio: 30, Preempt: 58,cputot: 201  
CPUProcess(6):, outer i: 2, Prio: 30, Preempt: 53,cputot: 201  
CPUProcess(6):, outer i: 2, Prio: 30, Preempt: 47,cputot: 201  
CPUProcess(6):, outer i: 2, Prio: 30, Preempt: 42,cputot: 201  
CPUProcess(6):, outer i: 2, Prio: 30, Preempt: 36,cputot: 201  
CPUProcess(6):, outer i: 2, Prio: 30, Preempt: 31,cputot: 201  
CPUProcess(6):, outer i: 2, Prio: 30, Preempt: 25,cputot: 201



CPUProcess(6):, outer i: 2, Prio: 30, Preempt: 20,cputot: 201

CPUProcess(6):, outer i: 2, Prio: 30, Preempt: 14,cputot: 201

CPUProcess(6):, outer i: 2, Prio: 30, Preempt: 9,cputot: 201

CPUProcess(6):, outer i: 2, Prio:t: 201

CPUProcess(7):, outer i: 1, Prio: 30, Preempt: 80,cputot: 241

CPUProcess(7):, outer i: 1, Prio: 30, Preempt: 74,cputot: 241

CPUProcess(7):, outer i: 1, Prio: 30, Preempt: 69,cputot: 241

CPUProcess(7):, outer i: 1, Prio: 30, Preempt: 63,cputot: 241

CPUProcess(7):, outer i: 1, Prio: 30, Preempt: 58,cputot: 241

CPUProcess(7):, outer i: 2, Prio: 30, Preempt: 52,cputot: 241

CPUProcess(7):, outer i: 2, Prio: 30, Preempt: 47,cputot: 241

CPUProcess(7):, outer i: 2, Prio: 30, Preempt: 41,cputot: 241

CPUProcess(7):, outer i: 2, Prio: 30, Preempt: 36,cputot: 241

CPUProcess(7):, outer i: 2, Prio: 30, Preempt: 30,cputot: 241

CPUProcess(7):, outer i: 2, Prio: 30, Preempt: 25,cputot: 241

CPUProcess(7):, outer i: 2, Prio: 30, Preempt: 20,cputot: 241

CPUProcess(7):, outer i: 2, Prio: 30, Preempt: 14,cputot: 241

CPUProcess(7):, outer i: 2, Prio: 30, Preempt: 9,cputot: 241

CPUProcess(7):, outer i: 2, Prputot: 81

CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 120,cputot: 161

CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 114,cputot: 161

CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 108,cputot: 161

CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 103,cputot: 161  
CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 97,cputot: 161  
CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 92,cputot: 161  
CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 86,cputot: 161  
CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 81,cputot: 161  
CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 75,cputot: 161  
CPUProcess(3):, outer i: 3, Prio: 20, Preempt: 70,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 64,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 59,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 53,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 48,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 43,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 37,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 32,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 26,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 21,cputot: 161  
CPUProcess(3):, outer i: 4, Prio: 20, Preempt: 15,cputot: 161  
CPUProcess Finished(3): preputot:161, prprio:20, preempt:10  
reempt: 4,cputot: 121  
CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 118,cputot: 201  
CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 113,cputot: 201  
CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 107,cputot: 201

CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 102,cputot: 201  
CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 96,cputot: 201  
CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 91,cputot: 201  
CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 85,cputot: 201  
CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 80,cputot: 201  
CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 74,cputot: 201  
CPUProcess(4):, outer i: 3, Prio: 20, Preempt: 69,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 63,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 58,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 52,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 47,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 41,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 36,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 30,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 25,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 19,cputot: 201  
CPUProcess(4):, outer i: 4, Prio: 20, Preempt: 14,cputot: 201  
CPUProcess Finished(4): prcputot:201, prprio:20, preempt:8  
o: 30, Preempt: 3,cputot: 161  
CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 117,cputot: 241  
CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 112,cputot: 241  
CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 106,cputot: 241

CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 101,cputot: 241  
CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 95,cputot: 241  
CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 90,cputot: 241  
CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 84,cputot: 241  
CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 79,cputot: 241  
CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 73,cputot: 241  
CPUProcess(5):, outer i: 3, Prio: 20, Preempt: 68,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 62,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 57,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 51,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 46,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 40,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 35,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 29,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 24,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 18,cputot: 241  
CPUProcess(5):, outer i: 4, Prio: 20, Preempt: 13,cputot: 241  
CPUProcess Finished(5): preputot:241, prprio:20, preempt:7  
30, Preempt: 3,cputot: 201  
CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 118,cputot: 281  
CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 112,cputot: 281  
CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 107,cputot: 281

CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 101,cputot: 281  
CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 95,cputot: 281  
CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 90,cputot: 281  
CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 84,cputot: 281  
CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 79,cputot: 281  
CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 73,cputot: 281  
CPUProcess(6):, outer i: 3, Prio: 20, Preempt: 68,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 62,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 57,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 52,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 46,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 41,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 35,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 30,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 24,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 19,cputot: 281  
CPUProcess(6):, outer i: 4, Prio: 20, Preempt: 13,cputot: 281  
CPUProcess Finished(6): preputot:281, prprio:20, preempt:8  
io: 30, Preempt: 3,cputot: 241  
CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 118,cputot: 321  
CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 112,cputot: 321  
CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 107,cputot: 321

CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 101,cputot: 321  
CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 95,cputot: 321  
CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 90,cputot: 321  
CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 84,cputot: 321  
CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 79,cputot: 321  
CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 73,cputot: 321  
CPUProcess(7):, outer i: 3, Prio: 20, Preempt: 68,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 62,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 57,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 52,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 46,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 41,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 35,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 30,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 24,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 19,cputot: 321  
CPUProcess(7):, outer i: 4, Prio: 20, Preempt: 13,cputot: 321  
CPUProcess Finished(7): preputot:321, prprio:20, preempt:8

## IO TEST

Test for IO begins

IO(3):, outer i: 0, Prio: 10, Preempt: 160,cputot:1

IO(4):, outer i: 0, Prio: 10, Preempt: 160,cputot:1

IO(5):, outer i: 0, Prio: 10, Preempt: 160,cputot:1

IO(IO(4):, outer i: 0, Prio: 51, Preempt: 40,cputot:6

6):, outer i: 0, Prio: 10, Preempt: 160,cputot:1

IOIO(4):, outer i: 0, Prio: 58, Preempt: 40,cputot:10

(7):, outer i: 0, Prio: 10, Preempt: 160,cputot:1

IO(4):, outer i: 0, Prio: 58, Preempt: 40,cputot:14

IO(6):, outer i: 0, Prio: 51, Preempt: 40,cputot:IO(4):, outer i: 0, Prio: 58, Preempt: 40,cputot:14

IO(7):, outer i: 0, Prio: 58, Preempt: 40,cputot:7

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IO(4):, outer i: 0, Prio: 58, Preempt: 40,cputot:14

IO(6):, outer i: 0, Prio: 58, Preempt: 40,cputIO(4):, outer i: 0, Prio: 58, Preempt: 40,cputot:14

IO(7):, outer i: 0, Prio: 58, Preempt: 40,cputot:12ot:7

IO(4):, outer i: 0, Prio: 58, Preempt: 40,cputot:14

IO(6):, outer i: 0, Prio: 58, Preempt: 40,cputot:11

IO(7):, outer i: 0, Prio: 58, Preempt: 40,cputO(3):, outer i: 0, Prio: 10, Preempt: 160,cputot:1

IO(6):, outer i: 0, Prio: 58, Preempt: 40,cputot:11IO(4):, outer i: 0, Prio: 58, Preempt: 40,cputot:19

ot:17

IO(3):, outer i: 0, Prio: 58, Preempt: 40,c

IO(4):, ouputot:3

IO(7):, outer i: 0, Prio: 58, Preempt: 40, cputot:16

: 40, cputot:21

IO(3):, outer i: 0, Prio: 58, Preempt: 40, cputot:16

pt: 40, cputot:7

IO(7):, outer i: 0, Prio: 58, Preempt: 40, cputot:19

IO(3):, outer i: 0, Prio: 58, Preempt: 40, cputot:25

IO(3):, outer i: 0, Prio: 58, Preempt: 40, cputot:22

8, Preempt: 40, cputot:11

IO(7):, outer i: 0, Prio: 58, Preempt: 40, cputot:22

: 58, Preempt: 40, cputot:28

IO(3):, outer i: 0, Prio: 58, Preempt: 40, cputot:16

IO(4):, outer i: 1, Prio: 58, Preempt: 40, cputot:31

Preempt: 40, cputot:22

IO(6):, outer i: 0, Prio: 58, Preempt: 40, cputot:14

IO(7):, outer i: 8, Preempt: 40, cputot:21

IO(4):, outer i: 0, Prio: 58, Preempt: 40, cputot:31

IO(3):, outer i: 1, Prio: 58, Preempt: 40, cputot:25

IO(3):, outer i: 0, Prio: 58, Preempt: 40, cputot:18

(6):, outer i: 0, Prio: 58, Preempt: 40, cputot:26



IO(7):, outer i: 0, Prio: 58, Preempt: 40,cputot:3IO(3):, outer i: 0, Prio: 58, Preempt: 40,cputot:19

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IO(4):, outer i: 1, Prio: 58, Preempt: 40,cput3

IO(3):, outer i: 0, Prio: 58, Preempt: 40,cputot:19

Iot:26

IO(7):, outer i: 1, Prio: 58, Preempt: O(6):, outeIO(3):, outer i: 0, Prio: 58, Preempt: 40,cputot:19

40,cputot:39

IO(4):, outer i: 1, Prio: 58, Preemptr i: 1, PriIO(3):, outer i: 1, Prio: 58, Preempt: 40,cputot:19

: 40,cputot:31

IO(7):, outer i: 1, Prio: 58, Preemo: 58, PreeIO(3):, outer i: 1, Prio: 58, Preempt: 40,cputot:19

pt: 40,cputot:43

IO(4):, outer i: 1, Prio: 58, Preempt: 40,cputot:29

IO(3empt: 40,cputot:35

IO(7):, outer i: 1, Prio: ):, outer i: 1, Prio: 5IO(6):, outer i: 1, Prio: 58, Preempt: 40,cputot:33

58, Preempt: 40,cputot:47

IO(4):, outer i: 1, Pri8, Preempt: 40,cputot:1IO(6):, outer i: 1, Prio: 58, Preempt: 40,cputot:33

o: 58, Preempt: 40,cputot:38

IO(7):, outer i: 1, 9

IO(6):, outer i: 1, Prio: 58, PrPrio: 58, Preempt: 40,cIO(4):, outer i: 1, Prio: 58,  
Preempt: 40,cputot:41

eempt: 40,cputot:33

IO(3):, outer i: 1, Prio: 58,putot:50

IO(4):, outer Preempt: 40,cputot:24

IO(6):, out i: 2, Prio: 58, Preempt: 40,cputot:41

IO(7):er i: 1, Prio: 58, Preempt: 40,cputot:36

IO(3, outer i: 1, Prio: 58, Preempt: 40,cputot:54

IO(4):, outer i: 2, Prio: 58, Preempt: 40,cputot:43

):, outer i: 1, Prio: 58, Preempt: 40,cputot:27

IO(4):, outer i: 2, Prio: 58, Preempt: 40,cpuO(6):, outerIO(3):, outer i: 1, Prio: 58,  
Preempt: 40,cputot:28

tot:43

IO(7):, outer i: 1, Prio: 58, Preempt: 40, i: 1, Prio:IO(3):, outer i: 1, Prio: 58, Preempt:  
40,cputot:28

cputot:59

IO(4):, outer i: 2, Prio: 58, Preempt: 58, PreempIO(3):, outer i: 1, Prio: 58, Preempt:  
40,cputot:28

40,cputot:47

IO(7):, outer i: 1, Prio: 58, Preemptt: 40,cputoIO(3):, outer i: 1, Prio: 58, Preempt:  
40,cputot:28

: 40,cputot:63

IO(4):, outer i: 2, Prio: 58, Preemt:37

IO(3)pt: 40,cputot:51

IO(7):, outer i: 1, Prio: 58:, outer i: 1, Prio: 58IO(6):, outer i: 1, Prio: 58, Preempt:  
40,cputot:42

, Preempt: 40,cputot:67

IO(4):, outer i: 2, Prio: , Preempt: 40,cputot:28IO(6):, outer i: 1, Prio: 58, Preempt:  
40,cputot:42

58, Preempt: 40,cputot:55

IO(7):, outer i: 1, Pri

IO(6):, outer i: 1, Po: 58, Preempt: 40,cputot:70

IO(4)rio: 58, Preempt: 40,cputot:42

IO(3):, outer:, outer i: 2, Prio: 58, Preempt: 4IO(7):, outer i: 1, Prio: 58, Preempt:  
40,cputot:73

i: 2, Prio: 58, Preempt: 40,cputot:33

IO(6):, ou0,cputot:58

IO(7):, outer i: 2, Prio: 58, Preter i: 1, Prio: 58, PreIO(3):, outer i: 2, Prio: 58,  
Preempt: 40,cputot:35

empt: 40,cputot:73

IO(4):, outer i: 2, Prio: 58, Pempt: 40,cputot:44

IO(reempt: 40,cputot:62

IO(7):, outer i: 2, Prio3):, outer i: 2, Prio: IO(6):, outer i: 2, Prio: 58, Preempt:  
40,cputot:47

: 58, Preempt: 40,cputot:76

IO(4):, outer i: 2, P58, Preempt: 40,cputot:35

IO(6):, rio: 58, Preempt: 40,cputot:65

IO(7):, outer outer i: 2, Prio: 58, Preempt: 40,IO(3):, outer i: 2, Prio: 58, Preempt:  
40,cputot:38

i: 2, Prio: 58, Preempt: 40,cputot:79

IO(4):, outcputot:47

IO(3):, outer i: 2, Prio: 58, Preempt: 40,cputot:81

: 58, Preempt: 40,cputot:38

IO(6):, outer i: 2, Prio: 58, Preempt: 40,cputot:67

IO(7):, outer i: 2, Prio: 58, Preempt: 40,cputot:51

IO 2, Prio: 58, Preempt: 40,cputot:81

IO(4):, outer i: 2, Prio: 58, Preempt: 40,cputot:53

outer i: 3, Prio: 58, Preempt: 40,cputot:71

IO(7):, :41

IO(6):, outer i: 2, Prio: 58, Preempt: 40 outer i: 2IO(4):, outer i: 3, Prio: 58, Preempt: 40,cputot:72

,cputot:53

IO(3):, outer i: 2, Prio: 58, Preempt: 40, Prio: 58,IO(4):, outer i: 3, Prio: 58, Preempt: 40,cputot:72

40,cputot:46

IO(6):, outer i: 2, Prio: 58, Preempt: 40IO(4):, outer i: 3, Prio: 58, Preempt: 40,cputot:72

t: 40,cputot:57

IO(3):, outer i: 2, Prio: 58, Preempt: 40,cputot:83

IO(4):, outempt: 40,cputot:50

IO(6):, outer i: 3, Prio: 58, Preempt: 40,cputot:87

: 2, Prio: 58, Preempt: 40,cputot:61

IO(3):, outertot:72

IO(7):, outer i: 2, Prio: i: 2, Prio: 58, Preempt: 40,cputot:63

58, Preempt: 40,cputot:87

IO(4):, outer i: 3, Prio: 40,cputot:53

IO(6): 58, Preempt: 40,cputot:77

IO(7):, outer i: , outer i: 2, Prio: 58, Preempt: 40,cputot:57

2, Prio: 58, Preempt: 40,cputot:90

IO(4):, outer 0,cputot:63

IO(3):, outer i: 3, Prio: 3, Prio: 58, Preempt: 40,cputot:92

io: 58, Preempt: 40,cputot:57

IO(6):, outer i: 2, :80

IO(7):, outer i: 3, Prio: 58,Prio: 58, Preempt: 40,cputot:59

Preempt: 40,cputot:92

IO(4):, outer i: 3, Prio: 5,cputot:67

IO(3):, outer8, Preempt: 40,cputot:85

IO(7):, i: 3, Prio: 58, Preempt: 40,cputot:59

IO(6):outer i: 3, Prio: 58, Preempt: 40,cputot:95

I, outer i: 3, Prio: 58, Preempt: 40,cputot:71

IO(3):, outer i: 3, Prio: 58, Preempt: 40,cputot:61

O(4):, outer i: 3, Prio: 58, Preempt: 40,cputot:88IO(7):, outer i: 3, Prio: 58, Preempt: 40,cputot:96

IO(3):, outer i: 3, Prio: 58, Preempt: 40,cputot:6

IO(7):, outer i: 3, Prio: 58, Preempt: 40,cputot:96

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IO(4):, outer i: 3, Prio: 58, Preempt: 40,c(6):, outer IO(7):, outer i: 3, Prio: 58, Preempt: 40,cputot:96

putot:94

IO(3):, outer i: 3, Prio: 58, Preempt: 4i: 3, Prio: IO(7):, outer i: 3, Prio: 58, Preempt: 40,cputot:96

0,cputot:66

IO(4):, outer i: 4, Prio: 58, Preempt58, Preempt:IO(7):, outer i: 3, Prio: 58, Preempt: 40,cputot:96

: 40,cputot:98

IO(3):, outer i: 3, Prio: 58, Pree 40,cputot:7IO(7):, outer i: 3, Prio: 58, Preempt: 40,cputot:96

mpt: 40,cputot:70

IO(4):, outer i: 4, Prio: 58, P6

IO(7):, outer i: 3, reempt: 40,cputot:102

IO(3):, outPrio: 58, Preempt: 40,cputot:96

IOer i: 3, Prio: 58, Preempt: 40,cputot:74

IO(4(6):, outer i: 3, Prio: 58, Preempt: 40,cputotIO(7):, outer i: 3, Prio: 58, Preempt: 40,cputot:98

):, outer i: 4, Prio: 58, Preempt: 40,cputot:105

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IO(7):, outer i: 4, Prio: 58, Preempt: 40IO(3):, outeIO(4):, outer i: 4, Prio: 58,  
Preempt: 40,cputot:106

,cputot:98

IO(6):, outer i: 3, Prio: 58, Preemptr i: 3, PrioIO(4):, outer i: 4, Prio: 58, Preempt:  
40,cputot:106

: 40,cputot:86

IO(7):, outer i: 4, Prio: 58, Pre: 58, Preempt: 40,cputoIO(4):, outer i: 4, Prio: 58,  
Preempt: 40,cputot:106

empt: 40,cputot:102

IO(6):, outer i: 3, Prio: 58t:76

IO(4):, outer i: , Preempt: 40,cputot:90

IO(7):, ou4, Prio: 58, Preempt: 40,cputot:106

IO(3):, oter i: 4, Prio: 58, Preempt: 40,cputot:105

IOuter i: 3, Prio: 58, Preempt: 40,cputot:81

IO(6):, outer i: 3, Prio: 58, Preempt: 40,cputotIO(7):, outer i: 4, Prio: 58, Preempt:  
40,cputot:106

(4):, outer i: 4, Prio: 58, Preempt: 40,cputot:10IO(3):, outer i: 4, Prio: 58, Preempt:  
40,cputot:82

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IO(7):, outer i: 4, Prio: 58, Preempt: 40,cput8

IO(3):, outer i: 4, Prio: 58, Preempt: 40,cputot:82

Iot:106

IO(4):, outer i: 4, Prio: 58, Preempt:O(6):, outerIO(3):, outer i: 4, Prio: 58, Preempt:  
40,cputot:82

40,cputot:114

IO(7):, outer i: 4, Prio: 58, Pree i: 3, Prio:IO(3):, outer i: 4, Prio: 58, Preempt:  
40,cputot:82

mpt: 40,cputot:111

IO(4):, outer i: 4, Prio: 58, 58, Preempt: 40,cputotIO(3):, outer i: 4, Prio: 58, Preempt:  
40,cputot:82

Preempt: 40,cputot:118

IOProcess Finished(4): prcIO(7):, outer i: 4, Prio: 58, Preempt: 40,cputot:115  
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IO(3):, outer i: 4, Prio: 58, Preempt: 40,cputot:121, IO(7):, outer i: 4, Prio: 58,  
Preempt: 40,cputot:115

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IO(6):, outer i: 3, Prio: 58, Preempt: 40,prprio:58, IO(7):, outer i: 4, Prio: 58, Preempt:  
40,cputot:115

cputot:103

IO(3):, outer i: 4, Prio: 58, Preempt:preempt:37

IO(7):, outer i: 4, Prio: 58, Preempt: 40,cputot:115

IOProcess Finished(7): prcputot:115, prprio:58, preempt:36

40,cputot:86

IO(6):, outer i: 3, Prio: 58, Preempt: 40,cputot:107

IO(3):, outer i: 4, Prio: 58, Preempt: 40,cputIO(6):, outer i: 3, Prio: 58, Preempt:  
40,cputot:107

ot:90

IO(5):, outer i: 0, Prio: 10, Preempt: 160IO(6):, oute,cputot:1

IO(3):, outer i: 4, Prio: 58, Preempt: 40,cputr i: 4, Prio: 58, Preempt: 40,cputot:107



IO(5):, outer i: 0, Prio: 58, Preempt: 40,cputot:60t:94

IO(6):, outer i: 4, Prio: 58, Preempt: 40,cputot:10

IO(3):, outer i: 4, Prio: 58, Preempt: 40,cputot:99

IO8

IO(5):, outer i: 0, Prio: 58, Preempt: 40,cputot:11

PrIO(6):, outer i: 4, Prio: 58, Preempt: 40,cputocess Finished(3): preputot:99,  
prprio:58, preempt:36

IO(5):, outer i: 0, Prio: 58, Preempt: 40,cputot:11

ot:113

IO(5):, outerIO(6):, outer i: 4, Prio: 58, Preempt: 40,cputot:117

i: 0, Prio: 58, Preempt: 40,cputot:11

IO(6):, outer i: 4, Prio: 58, Preempt: 40,cputoIO(5):, outer i: 0, Prio: 58, Preempt:  
40,cputot:12

t:117

IO(5):, outerIO(6):, outer i: 4, Prio: 58, Preempt: 40,cputot:121

i: 0, Prio: 58, Preempt: 40,cputot:12

IO(6):, outer i: 4, Prio: 58, Preempt: 40,cputoIO(5):, outer i: 0, Prio: 58, Preempt:  
40,cputot:13

t:121

IO(5):, outerIO(6):, outer i: 4, Prio: 58, Preempt: 40,cputot:125

i: 0, Prio: 58, Preempt: 40,cputot:13

IO(6):, outer i: 4, Prio: 58, Preempt: 40,cputoIO(5):, outer i: 1, Prio: 58, Preempt:  
40,cputot:14

t:125

IO(5):, outerIO(6):, outer i: 4, Prio: 58, Preempt: 40,cputot:129

IOProcess Finished(6): prcputot:129, prprio:58, preempt:36

i: 1, Prio: 58, Preempt: 40,cputot:14

IO(5):, outer i: 1, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 1, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 1, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 1, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 1, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 1, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 1, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 1, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 2, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 3, Prio: 58, Preempt: 40,cputot:15

IO(5):, outer i: 3, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 3, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 3, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 3, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 3, Prio: 58, Preempt: 40,cputot:15  
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IO(5):, outer i: 3, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 4, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 4, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 4, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 4, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 4, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 4, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 4, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 4, Prio: 58, Preempt: 40,cputot:15  
IO(5):, outer i: 4, Prio: 58, Preempt: 40,cputot:15  
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