ASSIGNMENT – 4
REPORT

SPECIFICATION – 1:

1. strace:

The files to be added are as follows:

- strace.c – Contains code for strace

The files to be changed are as follows:

- kernel/
  - sysproc.c – sys_trace() function is added
  - syscall.h – Number declarations for SYS_trace function are made
  - syscall.c
- user/
  - user.h – Definiton of syscall is added
  - usys.pl
- Makefile – Definition of strace is added

2. sigalarm and sigreturn:

The files to be added are as follows:

- alarm.c

The files to be changed are as follows:

- kernel/
  - sysproc.c – sys_sigalarm() and sys_sigreturn() functions are added
  - syscall.h - Number declarations for SYS_sigalarm and SYS_sigreturn functions are made
  - syscall.c
  - proc.h
  - proc.c
  - trap.c – An else if condition is added

- user/
  - user.h – Definiton of syscall is added
  - usys.pl
- Makefile – Definition of alarm is added

SPECIFICATION – 2:

Implementation of the various implemented scheduling algorithms is as follows:

1. FCFS (First-come First-serve):

The files to be changed are as follows:

- kernel/
  - proc.h – Declarations of total_run_time, createdtime, endtime, no_of_times_scheduled, runtime are added
  - proc.c – Initialize all the above functions in allopcproc() function. scheduler() function is changed by adding FCFS
  - trap.c – Since FCFS is non-preemptive, yield() function is disabled

2. LBS (Lottery Based Scheduler):

The files to be changed are as follows:

- kernel/
  - proc.h – variables tickets and schedt are declared
  - proc.c – sgenrand(), genrand(), set_proc_tckts() and random_at_most(long max) are added. Changes are made to scheduler function. Some changes have been made to allocproc() and freeproc() , exit() and fork().

A new syscall sys_settickets() is added.

3. PBS (Priority Based Scheduler):

The files to be added are as follows:

- setpriority.c

The files to be changed are as follows:

- kernel/
  - sysproc.c
  - syscall.h - Number declaration for SYS_set_priority function is made
  - syscall.c
  - proc.h
  - proc.c
  - trap.c – updateTime() function is called from clock_intr() function
  - defs.h
- user/
  - user.h
  - usys.pl

set_priority() syscall is added to change priority of process.

4. <u>MLFQ (Multi Level Feedback Queue):</u>

The files to be changed are as follows:

- kernel/
  - proc.h
  - proc.c
  - param.h
  - trap.c – kerneltrap() and usertrap() functions yield when time slice of a process is exhausted

- Makefile is changed to support the SCHEDULER macro to compile the specified scheduling algorithm. It is changed accordingly. The following flags are used for compilation:
  - First Come First Serve = FCFS
  - Lottery Based Scheduler = LBS

- Priority Based Scheduler = PBS
- Multi Level Feedback Queue = MLFQ

The below results are obtained by running schedulertest on a **single** CPU.

	Average running time	**Average waiting time**
RR	37	316
FCFS	37	317
LBS	37	315
PBS	37	316
MLFQ	37	317

SPECIFICATION – 3:

The files to be changed are as follows:

- kernel/
  - kalloc.c – init_page_ref(), dec_page_ref(), inc_page_ref() and get_page_ref() are added. kinit() and kfree() functions are changed
  - vm.c – uvmcopy() function is changed in such a way that, instead of allocating new pages, it maps parent's physical pages into the child. Copyout() function is modified.
  - trap.c – page_fault_handler() function is added and usertrap() function is used to recognize page faults
  - riscv.h – declarations are made
  - defs.h – inc_page_ref() function is declared

- Makefile – cowtest is added