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| Problem Set 1: Week 1 ~ 7 | |
| Student ID: | Student Name: |

1. Define the operating system, and describe the main purposes of an operating system?

2. Represent the decimal number 63.25 in IEEE 754 standard single precision format

3. In RISC-V assembly, write an assembly language version of the following C code segment:

for (i = 0; I < 98; i++) {

C[i] = A[i+1] – A[i] + B[i+2]

}

The start addresses of arrays A, B, and C are stored in x18, x19, x20, respectively. The local variable i is stored in x5.

4. Describe each of the four segments of the memory layout of process: text, data, heap, and stack.

5. True or False

A. The unix exec system call creates a new process.

B. Processes may use the same virtual address but will actually access different physical addresses.

C. In a one-level paging scheme, a single page table and a single TLB are shared by all processes.

D. FCFS has throughput at least as good as RR.

6. How many processes are created?

# include <stdio.h>

# include <unistd.h>

int main(void)

{

fork();

fork();

fork();

return 0;  
}

7. Explain the difference between preemptive and nonpreemptive scheduling

8. Suppose that the following processes arrive for execution at the times indicated. Each process will run for the amount of time listed. In answering the questions, use nonpreemptive scheduling, and base all decisions on the information you have at the time the decision must be made.

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| Process | Arrival Time | Burst Time |
| P1 | 0.0 | 8 |
| P2 | 0.4 | 4 |
| P3 | 1.0 | 1 |

A. What is the average turnaround time for these processes with FCFS scheduling algorithm?

B. What is the average turnaround time for these processes with SJF scheduling algorithm?

9. Consider a virtual address space of 256 pages with a 4 KB page size, mapped onto a physical memory of 64 frames

A. How many bits are required in the virtual address?

B. How many bits are required in the physical address?

10. Consider an operating system that use hardware support for paging to provide virtual memory to applications.

A. Explain how space and time overheads arise from use of paging.

B. Explain how the Translation Lookaside Buffer (TLB) mitigates the time overheads.

C. Explain how the multi-level page table mitigate the space overheads.