

SP25 CSE2431 HOMEWORK 1

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Electronic Submission: **11:59 pm, Monday, Feb 03, 2025**

Point: 25 points (5% of total grade)

Instructions:

This homework will be submitted **online**. Student will do their homework on paper/word processor and scan/take photos/convert to **pdf file** and submit on Carmen on or before the due date. **Only pdf** will be accepted.

Question 1 (3 points): What is the output of the following program? List ALL the possible output(s).

```
int num = 99;

int main(int argc, char**argv){
    printf("start num is %d\n", num);
    num++;
    int rc = fork();
    if(rc>0){
        num+=10;
        printf("Parent's num is %d\n", num);
    }
    else if(rc==0){
        num+=30;
        printf("Child's num is %d\n", num);
    }
    num--;
    printf("end num is %d\n", num);
}
```

Question 2 (10 points): Which of the following scheduling algorithms could result in starvation? For those algorithms that might result in starvation, describe a situation in which starvation is likely to occur? **(2 points)**

1. First-come, first-served (FCFS)
2. Shortest Job First (SJF)
3. Round Robin
4. Basic MLFQ with first 4 rules.

Given the following mix of job, job lengths, and arrival times, assume a time slice of 10 seconds and compute the completion time for each job, average turnaround time, and

average response time for the FIFO, RR, and STCF algorithms. (For FIFO, the order of job is the order of scheduling) (8 points)

Job	Length (s)	Arrival Time
J1	85	0
J2	30	10
J3	35	10
J4	20	80
J5	50	85

A note: There might be different scheduling order, you only need to give one solution scheduling for each of the algorithms.

Question 3 (8 points): Analyze scheduling algorithms for the following five processes given each process' length and arrival time.

Processes	Length (s)	Arrival Time
P1	16	0
P2	7	2
P3	2	4
P4	4	6
P5	22	8

For each of the following scheduling algorithms draw a diagram about how processes are scheduled, calculate the turnaround time for each process and calculate the average turnaround time.

- 1) First In First Out (FIFO) [2 points]
- 2) Shortest Job First (SJF) (Assume OS first schedules at time 0 and then schedules whenever a process terminates.) [2 points]
- 3) Shortest Time to Completion First (STCF) [2 points]
- 4) Round Robin Scheduling (Assume that the time slice is 5 seconds. Assume that if a new process arrives as the time slice of the executing process expires the executing process is put at the end of the *current* waiting queue. Assume that if a process terminates before its current time slice expires, the next process will immediately get a new and full slice. E.g. if a process starts at 10 and has only 2 remaining jobs, the next process will start at 12 and continue till 12+5. [2 points]

Question 4 (4 points): Fix memory-related bugs in the following programs (one program may have more than one bugs). You can try to run it with valgrind, but remember that valgrind is not a panacea.

```
int *add(int *a, int *b){
    int *ret = malloc(sizeof(int));
    if(a==NULL || b==NULL)
        return NULL;
    *ret = *a + *b;
    return ret;
}

int main(int argc, char**argv){
    int a = 3;
    int b = 4;
    int * ret = add(&a, &b);
    if(ret==NULL)
        printf("Error\n");
    else
        printf("3+4=%d\n", *ret);
}
```