Operating Systems Design Lab
Computer Engineering Department
Fall 2023/2024
Lab 05: IPC Using Message Queues

Objectives

1. To understand inter-process communication using message queues.

Prelab

1. Read the section that addresses message queues in the lab manual.
2. Read the manual pages of the following systems calls:

```
#include <sys/types.h>
#include <sys/ipc.h>
#include <sys/msg.h>

int msgget(key_t key, int msgflg);
int msgsnd(int msqid, const void *msgp, size_t msgsz, int msgflg);
ssize_t msgrcv(int msqid, void *msgp, size_t msgsz, long msgtyp, int msgflg);
```

Experiment

1. Assume you have two processes, a parent and a child. The parent prints the numbers from 1 to 5, while the child prints the characters from A to E. Use a single message queue to synchronize the two processes such that they produce the following output:

```
1
A
2
B
....
5
E
```

2. Use one message queue to synchronize three processes P_1, P_2, and P_3 as follows (where P_1 is the parent of the other two):
   (a) P_1 reads a string from the standard input and sends it to P_2 and P_3 via the message queue. Then, it waits to receive converted versions of the string from P_2 and P_3 via the message queue and prints what it receives to the standard output.
   (b) P_2 converts the string to uppercase and sends it to P_3 via the same message queue.
   (c) P_3 convert the string to lowercase and sends it back to P_3 via the message queue.
   (d)

   The three processes redo the above tasks forever until the user enters "`exit`" as an input string.