OS Lab 5

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Q1. Write a producer and consumer program in C using the FIFO queue. The producer should write a set of 4 integers into the FIFO queue and the consumer should display the 4 integers.

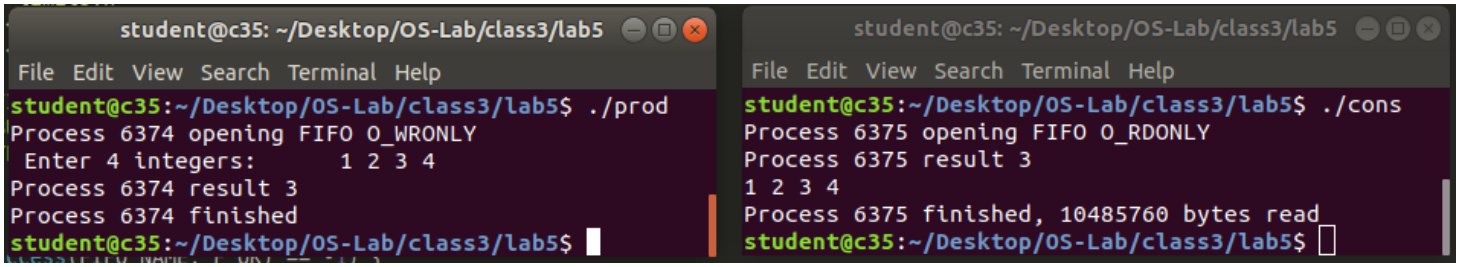
producer.c:

```
#include <unistd.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <fcntl.h>
#include <limits.h>
#include <sys/types.h>
#include <sys/stat.h>

#define FIFO_NAME "/tmp/my_fifo"
#define BUFFER_SIZE PIPE_BUF
#define TEN_MEG (1024 * 1024 * 10)

int main() {
	if (access(FIFO_NAME, F_OK) == -1) {
		int status = mkfifo(FIFO_NAME, 0777);

		if (status != 0) {
			printf("Could not create fifo %s\n", FIFO_NAME);
			exit(EXIT_FAILURE);
		}
	}

	printf("Enter 4 integers: ");
	int buffer[BUFFER_SIZE + 1];
	for (int i = 0; i < 4; i++) {
		scanf("%d", &buffer[i]);
	}

	int pipe_fd = open(FIFO_NAME, O_WRONLY);
	printf("Process %d result %d\n", getpid(), pipe_fd);

	int bytes_sent = 0;


	if (pipe_fd != -1) {
		while (bytes_sent < TEN_MEG) {

			int status = write(pipe_fd, buffer, BUFFER_SIZE);

			if (status == -1) {
				fprintf(stderr, "Write error on pipe\n");
				exit(EXIT_FAILURE);
			}

			bytes_sent += status;
		}
		close(pipe_fd);
	}
	else {
		exit(EXIT_FAILURE);
	}
```

```
	printf("Process %d finished\n", getpid());
	exit(EXIT_SUCCESS);
}
```

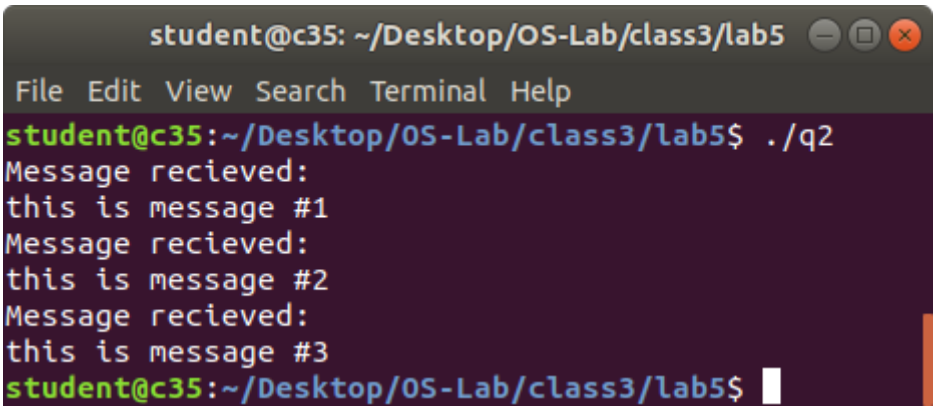
consumer.c:

```
#include <unistd.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <fcntl.h>
#include <limits.h>
#include <sys/types.h>
#include <sys/stat.h>

#define FIFO_NAME "/tmp/my_fifo"
#define BUFFER_SIZE PIPE_BUF

int main() {
	int pipe_fd = open(FIFO_NAME, O_RDONLY);
	int bytes_read = 0;

	if (pipe_fd != -1) {

		int buffer[BUFFER_SIZE + 1];
		memset(buffer, '\0', sizeof(buffer));

		int status;

		do {
			status = read(pipe_fd, buffer, BUFFER_SIZE);
			bytes_read += status;
		} while (status > 0);

		close(pipe_fd);

		for (int i = 0; i < 4; i++) {
			printf("%d ", buffer[i]);
		}
		printf("\n");
	}
	else {
		exit(EXIT_FAILURE);
	}

	printf("Process %d finished, %d bytes read\n", getpid(), bytes_read);
	exit(EXIT_SUCCESS);
}
```



Q2. Demonstrate creation, writing to and reading from a pipe.

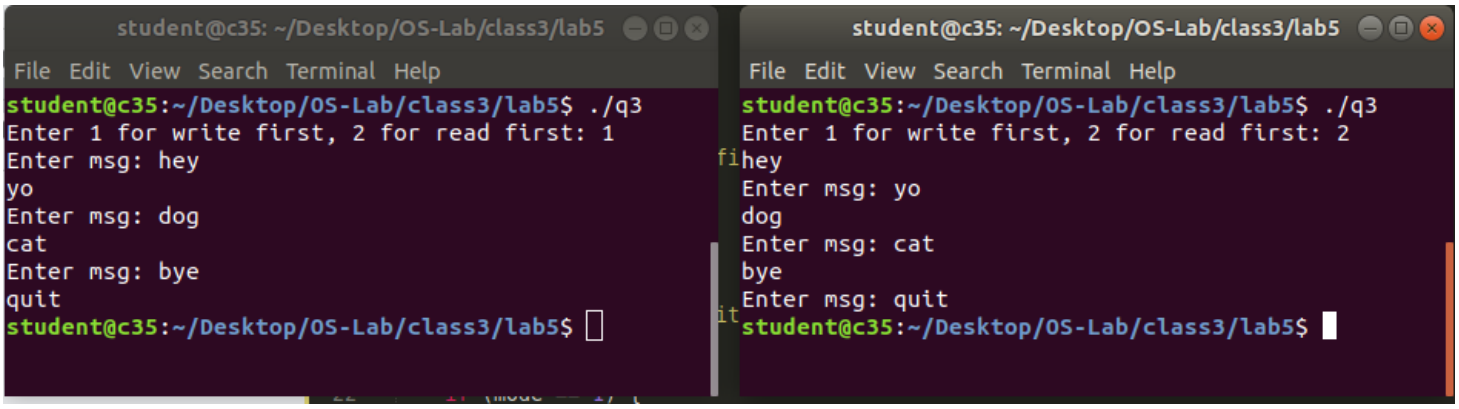
```
#include <sys/wait.h>
#include <assert.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <string.h>

char msg1[] = "this is message #1";
char msg2[] = "this is message #2";
char msg3[] = "this is message #3";

int main() {

      // creating a pipe
      int fd[2];
      if (pipe(fd) == -1) {
            printf("Pipe failed\n");
            exit(EXIT_FAILURE);
      }

      pid_t pid = fork();

      if (pid == -1) {
            printf("Fork failed\n");
            exit(EXIT_FAILURE);
      }

      // parent writes to the pipe
      if (pid != 0) {
            sleep(1);
            write(fd[1], msg1, 100);
            sleep(1);
            write(fd[1], msg2, 100);
            sleep(1);
            write(fd[1], msg3, 100);

            wait(NULL);
      }
      // child reads from the pipe
      else {
            char buff[100];

            for (int i = 0; i < 3; ++i) {
                  printf("Message recieved: \n");
                  read(fd[0], buff, 100);
                  printf("%s\n", buff);
            }

            exit(0);
      }
}
```



Q3. Write a C program to implement one side of FIFO.

```
#include <unistd.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <fcntl.h>
#include <limits.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <sys/wait.h>

#define FIFO_NAME "/tmp/myfifo"
#define BUFFER_SIZE 20

int main() {

      int mode;
      printf("Enter 1 for write first, 2 for read first: ");
      scanf("%d", &mode);

      if (mode == 1) {
            if (access(FIFO_NAME, F_OK) == -1) {
                  int status = mkfifo(FIFO_NAME, 0777);
                  if (status != 0) {
                        printf("Could not create fifo %s\n", FIFO_NAME);
                        exit(EXIT_FAILURE);
                  }
            }
      }

      int pipe_fd;

      while (mode != 0) {
            if (mode == 1) {

                  char buffer1[BUFFER_SIZE + 1];
                  printf("Enter msg: ");
                  scanf("%s", buffer1);

                  pipe_fd = open(FIFO_NAME, O_WRONLY);
                  if (pipe_fd != -1) {

                        int status = write(pipe_fd, buffer1, BUFFER_SIZE);

                        if (status == -1) {
                              printf("Error! Can't write to pipe\n");
                              exit(EXIT_FAILURE);
                        }

                        close(pipe_fd);
                        mode = 2;

                        if (strcmp(buffer1, "quit") == 0) {
                              mode = 0;
                        }
                  }
                  else {
                        printf("Can't open the pipe\n");
                        exit(EXIT_FAILURE);
                  }
            }
```

```
        else if (mode == 2) {

                char buffer2[BUFFER_SIZE + 1];
                memset(buffer2, '\0', sizeof(buffer2));

                pipe_fd = open(FIFO_NAME, O_RDONLY);

                if (pipe_fd != -1) {
                        int status;
                        do {
                                status = read(pipe_fd, buffer2, BUFFER_SIZE);
                        } while (status > 0);

                        close(pipe_fd);
                        mode = 1;
                        printf("%s \n", buffer2);

                        if (strcmp(buffer2, "quit") == 0) {
                                mode = 0;
                        }
                }
                else {
                        printf("Can't open the pipe\n");
                        exit(EXIT_FAILURE);
                }
        }
    }

    exit(EXIT_SUCCESS);
}
```



Q4. Write a C program for reading and writing binary files in C.

```c
#include <stdio.h>
#include <stdlib.h>

int main() {
      // open a binary file in wb mode
      FILE *fptr = fopen("hey.bin", "wb");

      if (fptr == NULL) {
            printf("Error! opening file");
            exit(1);
      }

      int n = 5;
      int num[3];

      num[0] = 34;
      num[1] = 21;
      num[2] = 65;

      fwrite(num, sizeof(num), 1, fptr);
      fclose(fptr);

      // open the same binary file in rb mode
      FILE* fptr2 = fopen("hey.bin", "rb");

      if (fptr2 == NULL) {
            printf("Error! opening file");
            exit(1);
      }

      fread(num, sizeof(num), 1, fptr2);
      fclose(fptr2);

      printf("n1: %d\tn2: %d\tn3: %d\n", num[0], num[1], num[2]);

      return 0;
}
```