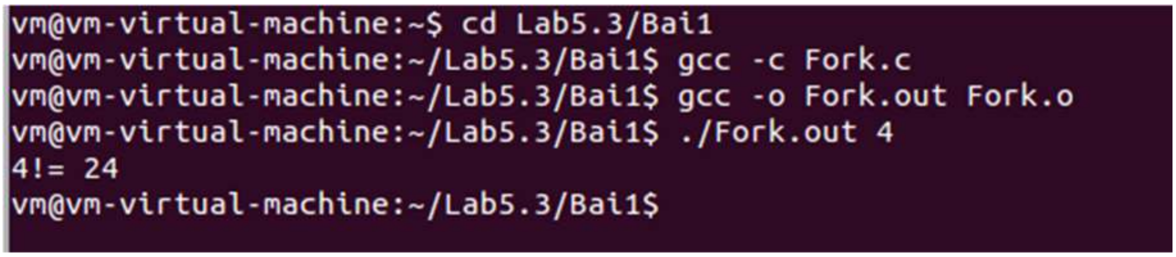
Bài 1:

Share memory:

```
#include <stdio.h>
#include <unistd.h>
#include <limits.h>
#include <string.h>
#include <stdlib.h>
#include <sys/types.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#define SIZE 256
int main(int argc, char* argv[])
{
        int *shm, shmid, k,pid;
        key_t key;
        if((key=ftok(".",65))==-1){
                perror("Key created.\n");
                return 1;
        }
        shmid = shmget(key, SIZE, IPC_CREAT | 0666);
        if (shmid == -1) {
                perror("Shared memory created.\n");
                return 2;
        }
        shm = (int*) shmat(shmid, 0, 0);
        pid = fork();
        if(pid==0) { // child
                shm[0] = atoi(argv[1]);
                sleep(4);
                printf("%d!= %d\n", shm[0],shm[1]);
                shmdt((void*) shm);
                shmctl(shmid, IPC_RMID, (struct shmid_ds*) 0);
                return 0;
        }
        else if(pid >0) { // parent

                sleep(2);
                int i,cnt=1;
    for(i=1;i<=shm[0];i++){
        cnt*=i;
    }
    shm[1]=cnt;
                shmdt((void*) shm);
                sleep(5);
                return 0;
        }
        else { perror("Fork failed."); return 4; }
        return 0;
}
```



```
vm@vm-virtual-machine:~$ cd Lab5.3/Bai1
vm@vm-virtual-machine:~/Lab5.3/Bai1$ gcc -c Fork.c
vm@vm-virtual-machine:~/Lab5.3/Bai1$ gcc -o Fork.out Fork.o
vm@vm-virtual-machine:~/Lab5.3/Bai1$ ./Fork.out 4
4!= 24
vm@vm-virtual-machine:~/Lab5.3/Bai1$
```

Message queue:

File: Writer.c

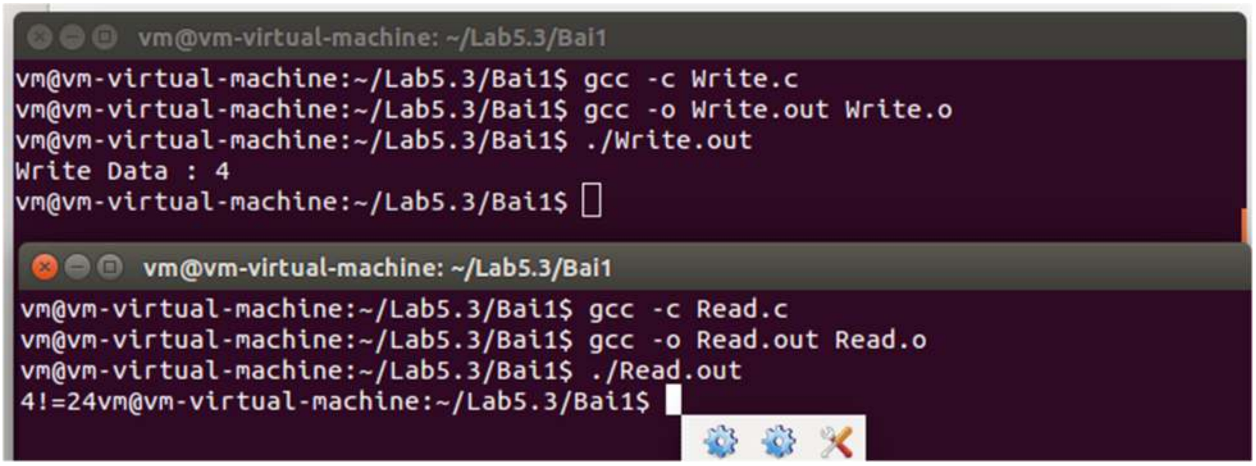
```
//Write
// C Program for Message Queue (Writer Process)
```

```
#include <stdio.h>

#include <sys/ipc.h>

#include <sys/msg.h>

#include <string.h>

// structure for message queue

struct mesg_buffer {

        long mesg_type;

        char mesg_text[100];

} message;

int main()

{

        key_t key;

        int msgid;

// ftok to generate unique key

        key = ftok("msg.txt",1);

// msgget creates a message queue

// and returns identifier

        msgid = msgget(key, 0666 | IPC_CREAT);

        message.mesg_type = 1;

        printf("Write Data : ");

        fgets(message.mesg_text, sizeof(message.mesg_text), stdin);

// msgsnd to send message

        msgsnd(msgid, &message, sizeof(message),0);

        return 0;

}
```

File reader.c

```
//read
```

```
// C Program for Message Queue (Reader Process)
#include <stdio.h>
#include <sys/ipc.h>
#include <sys/msg.h>
#include <string.h>
// structure for message queue
struct mesg_buffer {
	long mesg_type;
	char mesg_text[100];
} message;
int main()
{
	key_t key;
	int msgid;
// ftok to generate unique key
	key = ftok("msg.txt",1);
// msgget creates a message queue
// and returns identifier
	msgid = msgget(key, 0666 | IPC_CREAT);
// msgrcv to receive message
	msgrcv(msgid, &message, sizeof(message),1,0);
   int cnt=1,i;
   int n=atoi(message.mesg_text);
   for(i=1;i<=n;i++){
      cnt*=i;
   }
   printf("%d!=%d",n,cnt);
// to destroy the message queue
	msgctl(msgid, IPC_RMID, NULL);
	return 0;

}
```



```
vm@vm-virtual-machine:~/Lab5.3/Bai1$ gcc -c Write.c
vm@vm-virtual-machine:~/Lab5.3/Bai1$ gcc -o Write.out Write.o
vm@vm-virtual-machine:~/Lab5.3/Bai1$ ./Write.out
Write Data : 4
vm@vm-virtual-machine:~/Lab5.3/Bai1$
```

```
vm@vm-virtual-machine:~/Lab5.3/Bai1$ gcc -c Read.c
vm@vm-virtual-machine:~/Lab5.3/Bai1$ gcc -o Read.out Read.o
vm@vm-virtual-machine:~/Lab5.3/Bai1$ ./Read.out
4!=24vm@vm-virtual-machine:~/Lab5.3/Bai1$
```

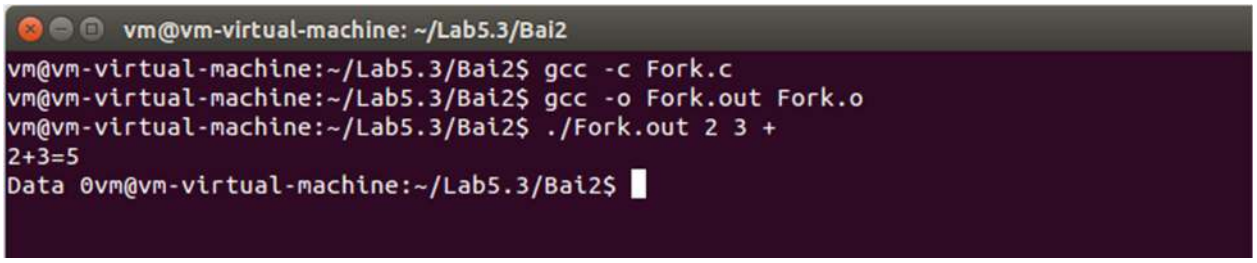
Bài 2:

Share memory:

```
#include <stdio.h>

#include <unistd.h>

#include <limits.h>

#include <string.h>

#include <stdlib.h>

#include <sys/types.h>

#include <sys/ipc.h>

#include <sys/shm.h>

#define SIZE 256

int main(int argc, char *argv[])

{

	int *shm, shmid, k, pid;

	key_t key;

	if ((key = ftok(".", 65)) == -1)

	{

		perror("Key created.\n");
```

```
        return 1;
}
shmid = shmget(key, SIZE, IPC_CREAT | 0666);
if (shmid == -1)
{
        perror("Shared memory created.\n");
        return 2;
}
shm = (int *)shmat(shmid, 0, 0);
pid = fork();
if (pid == 0)
{ // child
        shm[0] = atoi(argv[1]);
        shm[1] = atoi(argv[2]);
        shm[2] = (int)(argv[3][0]);
        sleep(3);
        switch (shm[2])
        {
                case 43:
                        printf("%d+%d=%d\n", shm[0],shm[1],shm[3]);
                        break;
                case 45:
                        printf("%d-%d=%d\n", shm[0],shm[1],shm[3]);
                        break;
                case 120:
                        printf("%d*%d=%d\n", shm[0],shm[1],shm[3]);
                        break;
                case 47:
                        printf("%d/%d=%d\n", shm[0],shm[1],shm[3]);
                        break;


            }

            shmdt((void *)shm);

            shmctl(shmid, IPC_RMID, (struct shmid_ds *)0);

            return 0;

}

else if (pid > 0)

{ // parent

            printf("Data %d",shm[2]);

            sleep(1);

            if(shm[2]==43){

                        shm[3]=shm[1]+shm[0];

            }else if(shm[2]==45){

                        shm[3]=shm[1]-shm[0];

            }else if(shm[2]==120){

                        shm[3]=shm[1]*shm[0];

            }else if(shm[2]==47){

                        shm[3]=shm[0]*1.0/shm[1];

            }

            shmdt((void *)shm);

            sleep(5);

            return 0;

}

else

{

            perror("Fork failed.");

            return 4;

}
```

```
	return 0;
}
```



```
vm@vm-virtual-machine: ~/Lab5.3/Bai2
vm@vm-virtual-machine:~/Lab5.3/Bai2$ gcc -c Fork.c
vm@vm-virtual-machine:~/Lab5.3/Bai2$ gcc -o Fork.out Fork.o
vm@vm-virtual-machine:~/Lab5.3/Bai2$ ./Fork.out 2 3 +
2+3=5
Data 0vm@vm-virtual-machine:~/Lab5.3/Bai2$
```

Message queue:

File: Writer.c

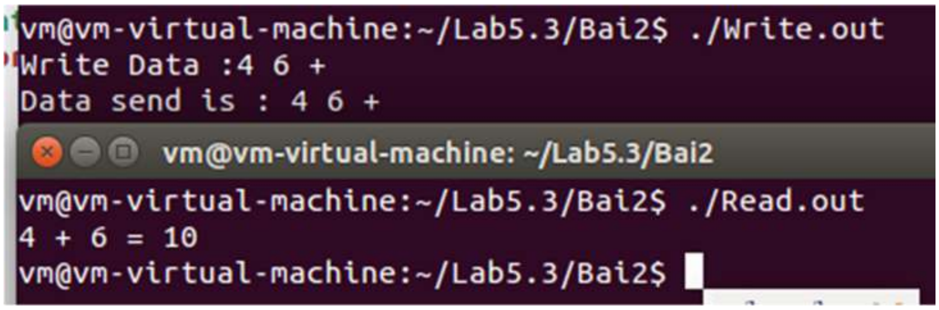
```
// C Program for Message Queue (Writer Process)
#include <stdio.h>
#include <sys/ipc.h>
#include <sys/msg.h>
#include <string.h>
// structure for message queue
struct mesg_buffer
{
	long mesg_type;
	char mesg_text[100];
} message;
int main()
{
	key_t key;
	int msgid;
	// ftok to generate unique key
	key = ftok("msg.txt", 1);
	// msgget creates a message queue
	// and returns identifier
```

```
        msgid = msgget(key, 0666 | IPC_CREAT);
        message.mesg_type = 1;
        printf("Write Data :");
        fflush(stdin);
        fgets(message.mesg_text, sizeof(message.mesg_text), stdin);
        msgsnd(msgid, &message, sizeof(message), 0);
        // display the message
        printf("Data send is : %s \n", message.mesg_text);
        return 0;
}
```

File reader.c

```
// C Program for Message Queue (Reader Process)
#include <stdio.h>
#include <sys/ipc.h>
#include <sys/msg.h>
#include <string.h>
// structure for message queue
struct mesg_buffer
{
        long mesg_type;
        char mesg_text[100];
} message;
int main()
{
        key_t key;
        int msgid;
        // ftok to generate unique key
        key = ftok("msg.txt", 1);
```

```
// msgget creates a message queue
// and returns identifier
msgid = msgget(key, 0666 | IPC_CREAT);
// msgrcv to receive message
msgrcv(msgid, &message, sizeof(message), 1, 0);
// message.mesg_text
int tmp[20];
int i, cnt = 0;
for (i = 0; i < strlen(message.mesg_text); i++)
{
        if (message.mesg_text[i] != ' ')
        {
                tmp[cnt] = message.mesg_text[i] - '0';
                cnt++;
        }
}
tmp[2] += '0';
switch (tmp[2])
{
        case 43:
                printf("%d + %d = %d\n", tmp[0], tmp[1], tmp[0] + tmp[1]);
                break;
        case 45:
                printf("%d - %d = %d\n", tmp[0], tmp[1], tmp[0] - tmp[1]);
                break;
        case 120:
        case 42:
                printf("%d * %d = %d\n", tmp[0], tmp[1], tmp[0] * tmp[1]);
                break;
                case 47:
                        printf("%d / %d = %f\n", tmp[0], tmp[1], tmp[0] * 1.0 / tmp[1]);
                        break;
        }
        // to destroy the message queue
        msgctl(msgid, IPC_RMID, NULL);
        return 0;
}
```



```
vm@vm-virtual-machine:~/Lab5.3/Bai2$ ./Write.out
Write Data :4 6 +
Data send is : 4 6 +
```

```
vm@vm-virtual-machine: ~/Lab5.3/Bai2
vm@vm-virtual-machine:~/Lab5.3/Bai2$ ./Read.out
4 + 6 = 10
vm@vm-virtual-machine:~/Lab5.3/Bai2$
```

Bài 3:

Message queue:

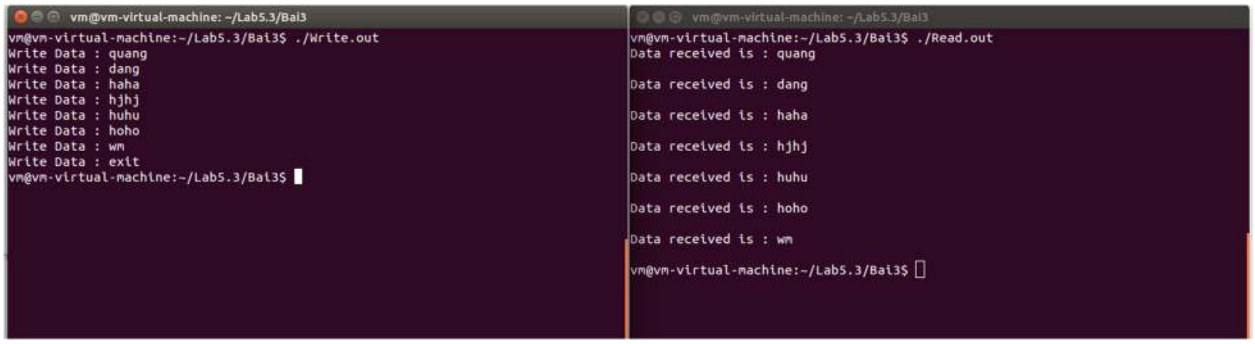
File: Writer.c

```
// C Program for Message Queue (Writer Process)
#include <stdio.h>
#include <sys/ipc.h>
#include <sys/msg.h>
#include <string.h>
// structure for message queue
struct mesg_buffer
{
        long mesg_type;
        char mesg_text[100];
} message;
int main()
{
	key_t key;
	int msgid;
	// ftok to generate unique key
	key = ftok("msg.txt", 1);
	// msgget creates a message queue
	// and returns identifier
	msgid = msgget(key, 0666 | IPC_CREAT);
	message.mesg_type = 1;
	while(1){
		printf("Write Data : ");
		fgets(message.mesg_text, sizeof(message.mesg_text), stdin);
		msgsnd(msgid, &message, sizeof(message), 0);
		if(strcmp(message.mesg_text, "exit\n") == 0)
			break;
	}
	// msgsnd to send message
	// display the message

	return 0;
}
```

File reader.c

```
// C Program for Message Queue (Reader Process)
#include <stdio.h>
#include <sys/ipc.h>
#include <sys/msg.h>
```

```
#include <string.h>
// structure for message queue
struct mesg_buffer {
        long mesg_type;
        char mesg_text[100];
} message;
int main()
{
        key_t key;
        int msgid;
// ftok to generate unique key
        key = ftok("msg.txt",1);
// msgget creates a message queue
// and returns identifier
        msgid = msgget(key, 0666 | IPC_CREAT);
// msgrcv to receive message
// display the message
        while(1){
                msgrcv(msgid, &message, sizeof(message), 1, 0);
                if(strcmp(message.mesg_text, "exit\n") == 0)
                        break;
                printf("Data received is : %s \n", message.mesg_text);
        }
// to destroy the message queue
        msgctl(msgid, IPC_RMID, NULL);
        return 0;
}
```



```
vm@vm-virtual-machine:~/Lab5.3/Bai3$ ./Write.out
Write Data : quang
Write Data : dang
Write Data : haha
Write Data : hjhj
Write Data : huhu
Write Data : hoho
Write Data : wm
Write Data : exit
vm@vm-virtual-machine:~/Lab5.3/Bai3$
```

```
vm@vm-virtual-machine:~/Lab5.3/Bai3$ ./Read.out
Data received is : quang

Data received is : dang

Data received is : haha

Data received is : hjhj

Data received is : huhu

Data received is : hoho

Data received is : wm

vm@vm-virtual-machine:~/Lab5.3/Bai3$
```

Bài thêm:

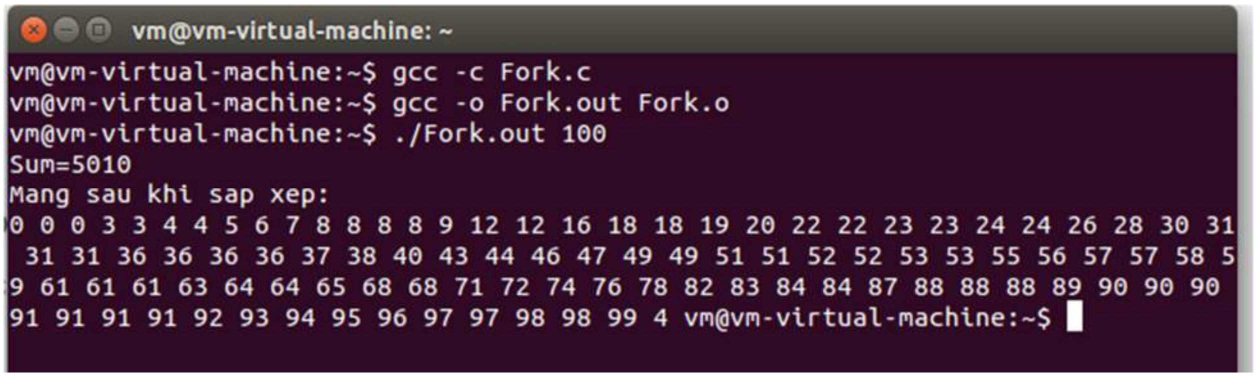
Share memory:

```
#include <stdio.h>

#include <unistd.h>

#include <limits.h>

#include <string.h>

#include <stdlib.h>

#include <sys/types.h>

#include <sys/ipc.h>

#include <sys/shm.h>

#include<time.h>


#define SIZE 256

int main(int argc, char* argv[])

{

        srand(time(NULL));

        int i;


        int *shm, shmid, k,pid;

        key_t key;

        if((key=ftok(".",65))==-1){

                perror("Key created.\n");

                return 1;
```

```
}
shmid = shmget(key, SIZE, IPC_CREAT | 0666);
if (shmid == -1) {
        perror("Shared memory created.\n");
        return 2;
}
shm = (int*) shmat(shmid, 0, 0);
pid = fork();
if(pid==0) { // child
        FILE *f = fopen("data", "w");
        int n = atoi(argv[1]);
        for (i = 0; i < n; ++i)
        {
                fprintf(f,"%d\n", rand() % 100);
        }
        fclose(f);

        FILE *f1 = fopen("data","r");
        int k,x=1;
        shm[0]=n;
        shm[shm[0]+1]=-1;
        while(fscanf(f1,"%d",&k) != EOF)
        {
                shm[x] = k;
                x++;
        }
        fclose(f1);
        //
        sleep(3);
```

```
		printf("Sum=%d\n",shm[shm[0]+1]);
		printf("Mang sau khi sap xep:\n");
		for (i = 1; i <= shm[0]; ++i)
		{
			printf("%d ",shm[i]);
		}
		shmdt((void*) shm);
		shmctl(shmid, IPC_RMID, (struct shmid_ds*) 0);
		return 0;
	}
	else if(pid >0) { // parent
		sleep(1);
		int sum=0;
		for (i = 1; i <= shm[0]; ++i)
		{
			sum+=shm[i];
		}
		shm[shm[0]+1]=sum;
		//sort
		int j,k;
		for (i = 1; i < shm[0]; ++i)
		{
			for (j = 1; j < shm[0]; ++j)
			{
				if (shm[i] < shm[j])
				{
					k = shm[i];
					shm[i] = shm[j];
					shm[j] = k;
```

```
                    }
                }
            }
            //TODO
            shmdt((void*) shm);
            sleep(5);
            return 0;
        }
        else { perror("Fork failed."); return 4; }
        return 0;
}
```



```
vm@vm-virtual-machine:~$ gcc -c Fork.c
vm@vm-virtual-machine:~$ gcc -o Fork.out Fork.o
vm@vm-virtual-machine:~$ ./Fork.out 100
Sum=5010
Mang sau khi sap xep:
0 0 0 3 3 4 4 5 6 7 8 8 8 8 9 12 12 16 18 18 19 20 22 22 23 23 24 24 26 28 30 31
 31 31 36 36 36 36 37 38 40 43 44 46 47 49 49 51 51 52 52 53 53 55 56 57 57 58 5
9 61 61 61 63 64 64 65 68 68 71 72 74 76 78 82 83 84 84 87 88 88 88 89 90 90 90
91 91 91 91 92 93 94 95 96 97 97 98 98 99 4 vm@vm-virtual-machine:~$
```