

## Assignment 4

**Q1-**The Sample example below has been explained during theory class.

Now create 2 programs to depict the below diagrams and print L0, L1, L2 and Bye

appropriately and observe the behaviour of the parent and child processes.

[Solution :-](#)

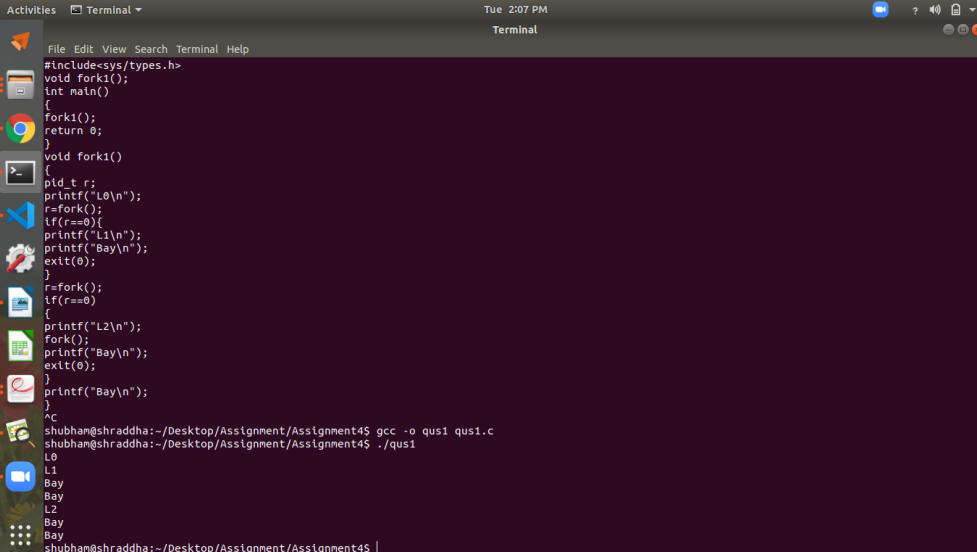
[Code :-](#)

```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
#include<sys/types.h>
void fork1();
int main()
{
fork1();
return 0;
}
void fork1()
{
pid_t r;
printf("L0\n");
r=fork();
if(r==0){
printf("L1\n");
printf("Bay\n");
exit(0);
}
r=fork();
if(r==0)
{
printf("L2\n");
```

```
fork();
printf("Bay\n");
exit(0);
}
printf("Bay\n");
}
```

## OUTPUT-

```
shubham@shraddha:~/Desktop/Assignment/Assignment4$ gcc -o qus1 qus1.c
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ./qus1
L0
L1
Bay
Bay
L2
Bay
Bay
```



```
File Edit View Search Terminal Help
#include<sys/types.h>
void fork1();
int main()
{
    fork1();
    return 0;
}
void fork1()
{
    pid_t r;
    printf("L0\n");
    r=fork();
    if(r==0){
        printf("L1\n");
        printf("Bay\n");
        exit(0);
    }
    r=fork();
    if(r==0)
    {
        printf("L2\n");
        fork();
        printf("Bay\n");
        exit(0);
    }
    printf("Bay\n");
}
^C
shubham@shraddha:~/Desktop/Assignment/Assignment4$ gcc -o qus1 qus1.c
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ./qus1
L0
L1
Bay
Bay
L2
Bay
Bay
shubham@shraddha:~/Desktop/Assignment/Assignment4$
```

## Qus1 Part b-

[Solution :-](#)

[Code :-](#)

```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
#include<sys/types.h>
void fork1();
int main()
{
fork1();
return 0;
}
void fork1()
{
pid_t r;
printf("L0\n");
r=fork();
if(r==0){
printf("L1\n");
printf("Bay\n");
exit(0);
}
r=fork();
if(r==0)
{
printf("L2\n");
fork();
printf("Bay\n");
exit(0);
}
printf("Bay\n");
}
```

## Output -

shubham@shraddha:~/Desktop/Assignment/Assignment4\$ gcc -o partb partb.c

shubham@shraddha:~/Desktop/Assignment/Assignment4\$ ./partb

L0

L1

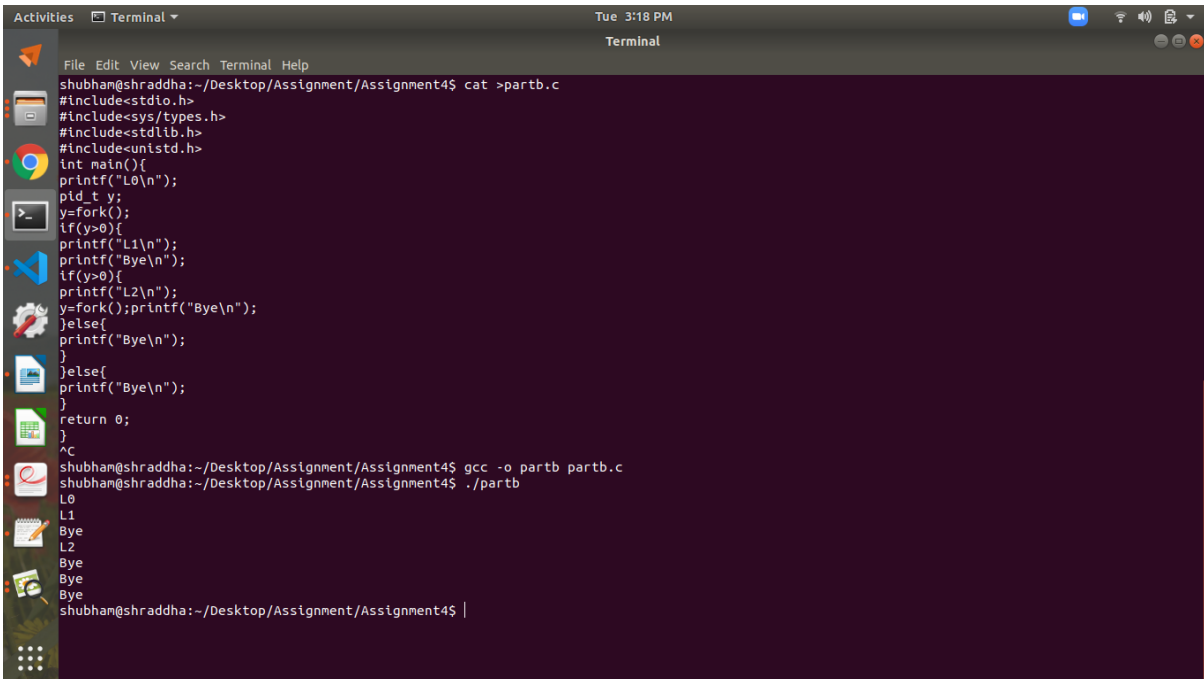
Bye

L2

Bye

Bye

Bye



```
Activities Terminal Tue 3:18 PM
Terminal
File Edit View Search Terminal Help
shubham@shraddha:~/Desktop/Assignment/Assignment4$ cat >partb.c
#include<stdio.h>
#include<sys/types.h>
#include<stdlib.h>
#include<unistd.h>
int main(){
printf("L0\n");
pid_t y;
y=fork();
if(y>0){
printf("L1\n");
printf("Bye\n");
}
if(y>0){
printf("L2\n");
y=fork();printf("Bye\n");
}else{
printf("Bye\n");
}
}else{
printf("Bye\n");
}
return 0;
}
^C
shubham@shraddha:~/Desktop/Assignment/Assignment4$ gcc -o partb partb.c
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ./partb
L0
L1
Bye
L2
Bye
Bye
Bye
shubham@shraddha:~/Desktop/Assignment/Assignment4$
```

Qus 2. Write a C program that initializes a global integer to 2 and then creates a child process. Print the process id and value of the integer in the parent process and child process. Let the child process change the integer to 9 and exit. The parent process has to wait for the child process to exit. After the child process exits, print the value of the integer in the parent process. Observe and understand the outputs. (Suggested System calls –(fork, wait, getpid )

Ans 2-

[Solution :-](#)

[Code :-](#)

```
#include<stdio.h>
#include<sys/types.h>
#include<sys/wait.h>
#include<unistd.h>
#include<stdlib.h>
int glovar=2;
int main()
{
    pid_t child;
    child=fork();
    if(child>=0)
    {
        if(child==0)
        {
            printf("\nI am child having PID %d\n",getpid());
            printf("\nMy parent PPID %d\n",getppid());printf("\nGloclbal Variable %d\n",glovar);
            glovar=9;
            exit(0);
        }
        else
        {
            printf("\n I am parent having PID %d \n",getpid());
            printf("\nMy child PID %d \n",child);
            printf("\nGlobal Variable %d\n",glovar);
            wait(NULL);
```

```

printf("\nGlobal Variable %d\n",glovar);
}
}
else
{
printf("fork failed!!!");
}
return 0;
}

```

## Output-

```

shubham@shraddha:~/Desktop/Assignment/Assignment4$ gcc -o second second.c
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ./second

```

I am parent having PID 16273

My child PID 16274

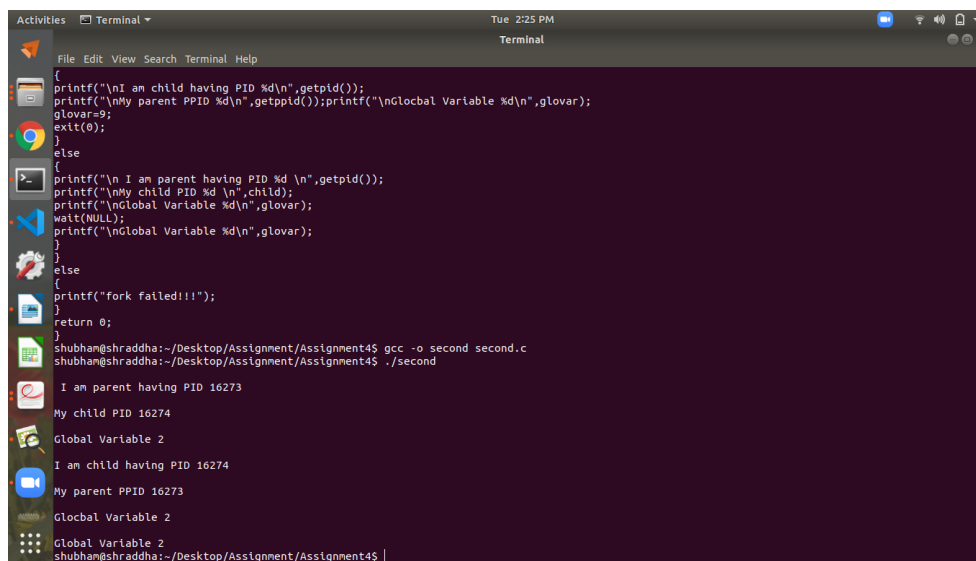
Global Variable 2

I am child having PID 16274

My parent PPID 16273

Glocbal Variable 2

Global Variable 2



```

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{
printf("\nI am child having PID %d\n",getpid());
printf("\nMy parent PPID %d\n",getppid());printf("\nGlocbal Variable %d\n",glovar);
glovar=9;
exit(0);
}
else
{
printf("\n I am parent having PID %d \n",getpid());
printf("\nMy child PID %d \n",child);
printf("\nGlobal Variable %d\n",glovar);
wait(NULL);
printf("\nGlobal Variable %d\n",glovar);
}
}
else
{
printf("fork failed!!!");
}
return 0;
}
shubham@shraddha:~/Desktop/Assignment/Assignment4$ gcc -o second second.c
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ./second

I am parent having PID 16273
My child PID 16274
Global Variable 2
I am child having PID 16274
My parent PPID 16273
Glocbal Variable 2
Global Variable 2
shubham@shraddha:~/Desktop/Assignment/Assignment4$

```

Qus 3. Write a C program to create a zombie process and print to show the process is in zombie state.

Ans 3-

**Solution :-**

**Code :-**

```
#include<stdio.h>
#include<stdlib.h>
#include<sys/types.h>
int main(){
    pid_t y;
    y=fork();
    if(y==-1){
        printf("Fork function failed\n");
    }
    if(y==0){
        printf("Hello I am a Child and my pid is =%d\n",getpid());
        printf("And My parent pid is =%d\n",getppid());
    }else{
        sleep(4);
        printf("Hello I am Parent and my pid is =%d\n",getpid());
        printf("Ans my child pid is =%d\n",y);
    }
    return 0;
}
```

**Output-**

```
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ./Zombi
Hello I am a Child and my pid is =16922
And My parent pid is =16921
Hello I am Parent and my pid is =16921
Ans my child pid is =16922
```

```
shubhangshraddha:~/Desktop/Assignment/Assignment4$ ./Zombi
Hello I am a Child and my pid is =16922
And My parent pid is =16921
Hello I am Parent and my pid is =16921
Ans my child pid is =16922
shubhangshraddha:~/Desktop/Assignment/Assignment4$ ./Zombi & ps
[1] 16960
Hello I am a Child and my pid is =16962
And My parent pid is =16960
PID TTY          TIME CMD
4289 pts/0      00:00:00 bash
16960 pts/0      00:00:00 Zombi
16961 pts/0      00:00:00 ps
16962 pts/0      00:00:00 Zombi <defunct>
shubhangshraddha:~/Desktop/Assignment/Assignment4$ Hello I am Parent and my pid is =16960
Ans my child pid is =16962
```

4. Write a C program to create an orphan process and print to show the said process is an orphan. (Suggested System calls – fork, sleep, ps, getppid)

**Sol-**

shubham@shraddha:~/Desktop/Assignment/Assignment4\$ **Cat**  
**>orphan.c**

```
#include<stdio.h>
#include<stdlib.h>
#include<sys/types.h>
int main(){
pid_t y;
y=fork();
if(y==-1){
printf("Fork function failed\n");
}
if(y==0){
sleep(3);printf("Hello I am a Child and my pid is =%d\n",getpid());
printf("And My parent pid is =%d\n",getppid());
}else{
printf("Hello I am Parent and my pid is =%d\n",getpid());
printf("Ans my child pid is =%d\n",y);
}
return 0;
}
```

Output-

shubham@shraddha:~/Desktop/Assignment/Assignment4\$ ./orphan

Hello I am Parent and my pid is =17502  
Ans my child pid is =17503

shubham@shraddha:~/Desktop/Assignment/Assignment4\$

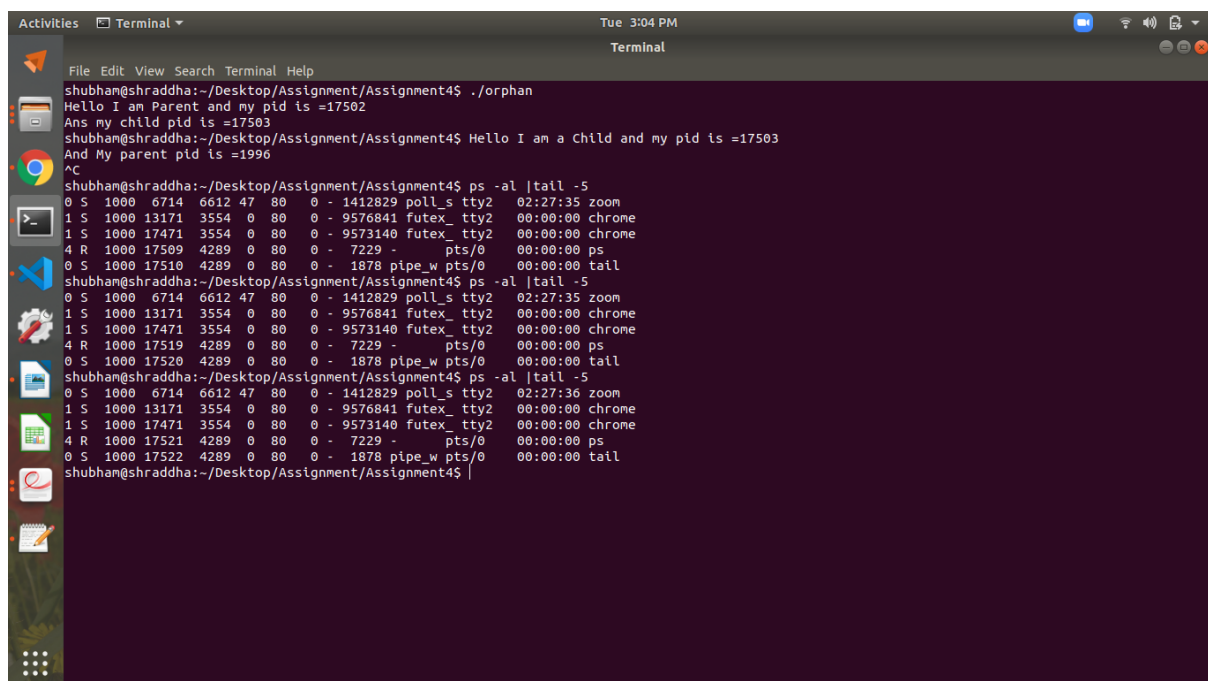


Hello I am a Child and my pid is =17503  
And My parent pid is =1996

```
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ps -al |tail -5
0 S 1000 6714 6612 47 80 0 - 1412829 poll_s tty2 02:27:35 zoom
1 S 1000 13171 3554 0 80 0 - 9576841 futex_ tty2 00:00:00 chrome
1 S 1000 17471 3554 0 80 0 - 9573140 futex_ tty2 00:00:00 chrome
4 R 1000 17509 4289 0 80 0 - 7229 - pts/0 00:00:00 ps
0 S 1000 17510 4289 0 80 0 - 1878 pipe_w pts/0 00:00:00 tail
```

```
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ps -al |tail -5
0 S 1000 6714 6612 47 80 0 - 1412829 poll_s tty2 02:27:35 zoom
1 S 1000 13171 3554 0 80 0 - 9576841 futex_ tty2 00:00:00 chrome
1 S 1000 17471 3554 0 80 0 - 9573140 futex_ tty2 00:00:00 chrome
4 R 1000 17519 4289 0 80 0 - 7229 - pts/0 00:00:00 ps
0 S 1000 17520 4289 0 80 0 - 1878 pipe_w pts/0 00:00:00 tail
```

```
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ps -al |tail -5
0 S 1000 6714 6612 47 80 0 - 1412829 poll_s tty2 02:27:36 zoom
1 S 1000 13171 3554 0 80 0 - 9576841 futex_ tty2 00:00:00 chrome
1 S 1000 17471 3554 0 80 0 - 9573140 futex_ tty2 00:00:00 chrome
4 R 1000 17521 4289 0 80 0 - 7229 - pts/0 00:00:00 ps
0 S 1000 17522 4289 0 80 0 - 1878 pipe_w pts/0 00:00:00 tail
shubham@shraddha:~/Desktop/Assignment/Assignment4$
```



```
Activities  Terminal  Tue 3:04 PM
File Edit View Search Terminal Help
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ./orphan
Hello I am Parent and my pid is =17502
Ans my child pid is =17503
shubham@shraddha:~/Desktop/Assignment/Assignment4$ Hello I am a Child and my pid is =17503
And My parent pid is =1996
^C
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ps -al |tail -5
0 S 1000 6714 6612 47 80 0 - 1412829 poll_s tty2 02:27:35 zoom
1 S 1000 13171 3554 0 80 0 - 9576841 futex_ tty2 00:00:00 chrome
1 S 1000 17471 3554 0 80 0 - 9573140 futex_ tty2 00:00:00 chrome
4 R 1000 17509 4289 0 80 0 - 7229 - pts/0 00:00:00 ps
0 S 1000 17510 4289 0 80 0 - 1878 pipe_w pts/0 00:00:00 tail
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ps -al |tail -5
0 S 1000 6714 6612 47 80 0 - 1412829 poll_s tty2 02:27:35 zoom
1 S 1000 13171 3554 0 80 0 - 9576841 futex_ tty2 00:00:00 chrome
1 S 1000 17471 3554 0 80 0 - 9573140 futex_ tty2 00:00:00 chrome
4 R 1000 17519 4289 0 80 0 - 7229 - pts/0 00:00:00 ps
0 S 1000 17520 4289 0 80 0 - 1878 pipe_w pts/0 00:00:00 tail
shubham@shraddha:~/Desktop/Assignment/Assignment4$ ps -al |tail -5
0 S 1000 6714 6612 47 80 0 - 1412829 poll_s tty2 02:27:36 zoom
1 S 1000 13171 3554 0 80 0 - 9576841 futex_ tty2 00:00:00 chrome
1 S 1000 17471 3554 0 80 0 - 9573140 futex_ tty2 00:00:00 chrome
4 R 1000 17521 4289 0 80 0 - 7229 - pts/0 00:00:00 ps
0 S 1000 17522 4289 0 80 0 - 1878 pipe_w pts/0 00:00:00 tail
shubham@shraddha:~/Desktop/Assignment/Assignment4$
```

Submitted To: -  
Deepika Ma'am

Submitted By: -  
Shraddha Tripathi