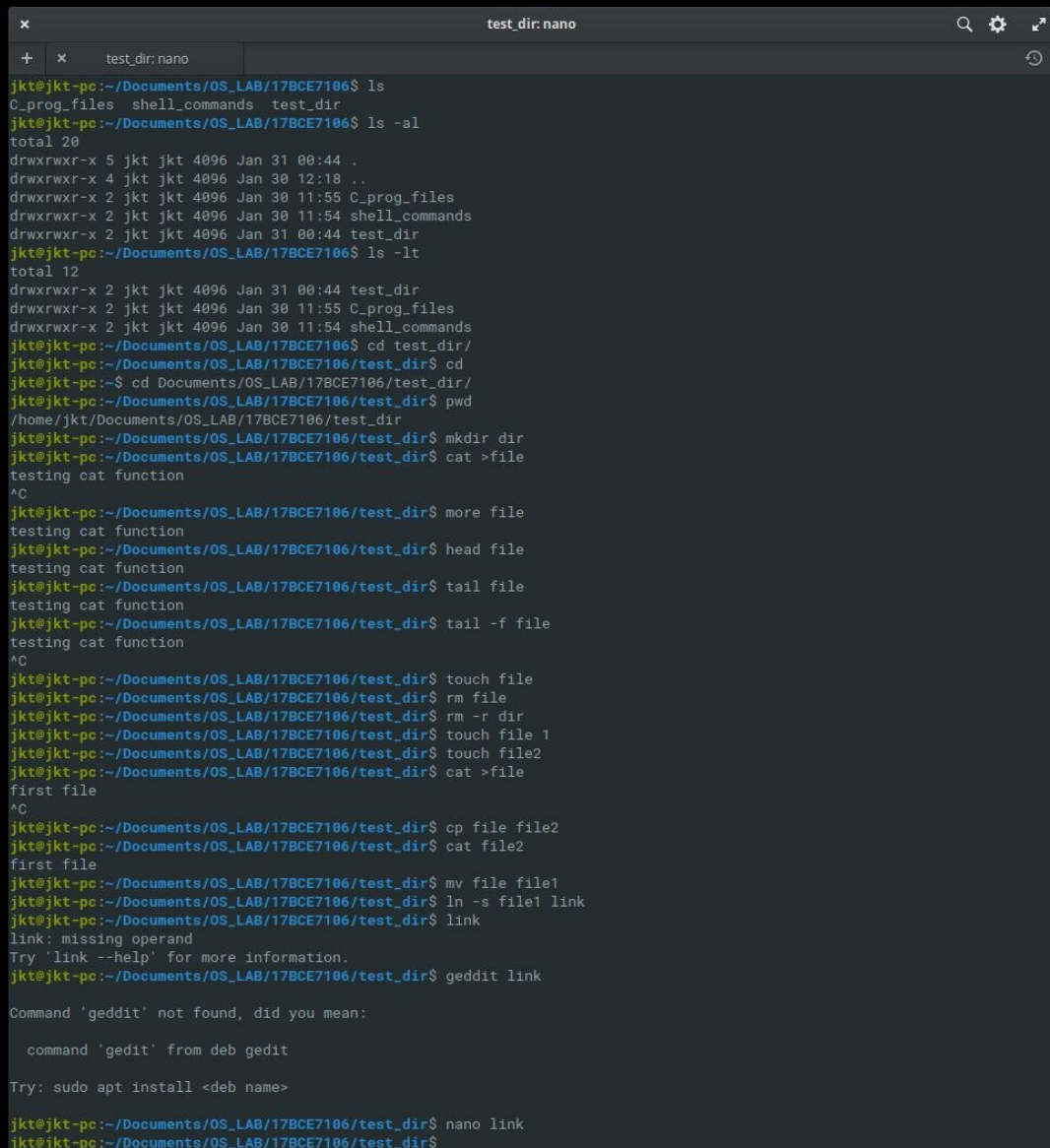# LAB MANUAL

JATIN KARTHIK TRIPATHY

(17BCE7106)

- LINUX BASIC COMMANDS

```
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ ps
  PID TTY          TIME CMD
 5388 pts/0    00:00:00 bash
 6895 pts/0    00:00:00 ps
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ bg
bash: bg: current: no such job
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ fg
bash: fg: current: no such job
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ grep 'st' fil1
grep: fil1: No such file or directory
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ grep 'st' file1
first file
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ grep -r 'st' file1
first file
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ locate file1
/usr/share/doc/libsndfile1
/usr/share/doc/libxkbfile1
/usr/share/doc/libsndfile1/changelog.Debian.gz
/usr/share/doc/libsndfile1/copyright
/usr/share/doc/libxkbfile1/changelog.Debian.gz
/usr/share/doc/libxkbfile1/copyright
/var/lib/dpkg/info/libsndfile1:amd64.list
/var/lib/dpkg/info/libsndfile1:amd64.md5sums
/var/lib/dpkg/info/libsndfile1:amd64.shlibs
/var/lib/dpkg/info/libsndfile1:amd64.symbols
/var/lib/dpkg/info/libsndfile1:amd64.triggers
/var/lib/dpkg/info/libxkbfile1:amd64.list
/var/lib/dpkg/info/libxkbfile1:amd64.md5sums
/var/lib/dpkg/info/libxkbfile1:amd64.shlibs
/var/lib/dpkg/info/libxkbfile1:amd64.triggers
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ pgrep 'jkt'
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ date
Thu Jan 31 00:57:44 IST 2019
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ cal
    January 2019
Su Mo Tu We Th Fr Sa
       1  2  3  4  5
 6  7  8  9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31

jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ uptime
 00:57:55 up 35 min,  1 user,  load average: 0.15, 0.32, 0.38
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ w
 00:58:09 up 35 min,  1 user,  load average: 0.12, 0.31, 0.37
USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
jkt      tty7     :0               00:22   35:29  54.72s  0.19s /usr/lib/gnome-session/gnome-session-binary --session=
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ whoami
jkt
```

```
                                    test_dir: cat                         🔍  ⚙  ⤢

 +    ×     test_dir: cat                                                          ↺

jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ finger jkt
Login: jkt                              Name: Jatin
Directory: /home/jkt                    Shell: /bin/bash
On since Thu Jan 31 00:22 (IST) on tty7 from :0
   39 minutes 30 seconds idle
No mail.
No Plan.
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ uname -a
Linux jkt-pc 4.15.0-43-generic #46-Ubuntu SMP Thu Dec 6 14:45:28 UTC 2018 x86_64 x86_64 x86_64 GNU/Linux
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ cat /proc/cpuinfo
processor       : 0
vendor_id       : GenuineIntel
cpu family      : 6
model           : 158
model name      : Intel(R) Core(TM) i7-7700HQ CPU @ 2.80GHz
stepping        : 9
microcode       : 0x8e
cpu MHz         : 959.843
cache size      : 6144 KB
physical id     : 0
siblings        : 8
core id         : 0
cpu cores       : 4
apicid          : 0
initial apicid  : 0
fpu             : yes
fpu_exception   : yes
cpuid level     : 22
wp              : yes
flags           : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse
 sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_
tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid
sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ep
t invpcid_single pti ssbd ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 avx2 smep bmi2
 erms invpcid mpx rdseed adx smap clflushopt intel_pt xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts hwp hwp_no
tify hwp_act_window hwp_epp flush_l1d
bugs            : cpu_meltdown spectre_v1 spectre_v2 spec_store_bypass l1tf
bogomips        : 5616.00
clflush size    : 64
cache_alignment : 64
address sizes   : 39 bits physical, 48 bits virtual
power management:

processor       : 1
vendor_id       : GenuineIntel
cpu family      : 6
model           : 158
model name      : Intel(R) Core(TM) i7-7700HQ CPU @ 2.80GHz
stepping        : 9
microcode       : 0x8e
cpu MHz         : 1036.919
cache size      : 6144 KB
physical id     : 0
siblings        : 8
core id         : 1
cpu cores       : 4
apicid          : 2
initial apicid  : 2
```

```
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ cat /proc/meminfo
MemTotal:        8030280 kB
MemFree:         5513100 kB
MemAvailable:    6374580 kB
Buffers:           69076 kB
Cached:          1275072 kB
SwapCached:            0 kB
Active:          1465968 kB
Inactive:         803456 kB
Active(anon):     924376 kB
Inactive(anon):   295320 kB
Active(file):     541592 kB
Inactive(file):   508136 kB
Unevictable:          48 kB
Mlocked:              48 kB
SwapTotal:       2097148 kB
SwapFree:        2097148 kB
Dirty:               192 kB
Writeback:             0 kB
AnonPages:        925300 kB
Mapped:           401924 kB
Shmem:            297784 kB
Slab:             124564 kB
SReclaimable:      74396 kB
SUnreclaim:        50168 kB
KernelStack:        9872 kB
PageTables:        43472 kB
NFS_Unstable:          0 kB
Bounce:                0 kB
WritebackTmp:          0 kB
CommitLimit:     6112288 kB
Committed_AS:    5682768 kB
VmallocTotal:   34359738367 kB
VmallocUsed:           0 kB
VmallocChunk:          0 kB
HardwareCorrupted:     0 kB
AnonHugePages:         0 kB
ShmemHugePages:        0 kB
ShmemPmdMapped:        0 kB
CmaTotal:              0 kB
CmaFree:               0 kB
HugePages_Total:       0
HugePages_Free:        0
HugePages_Rsvd:        0
HugePages_Surp:        0
Hugepagesize:       2048 kB
DirectMap4k:      191140 kB
DirectMap2M:     4915200 kB
DirectMap1G:     3145728 kB
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ man pwd
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ man cat
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ df
Filesystem     1K-blocks     Used Available Use% Mounted on
udev            3983372        0   3983372   0% /dev
tmpfs            803028     1724    801304   1% /run
/dev/sda11     51342240  9369040  39335380  20% /
tmpfs           4015140    75596   3939544   2% /dev/shm
tmpfs              5120        4      5116   1% /run/lock
```

```
/dev/sda11        51342240 9369040  39335380  20% /
tmpfs              4015140   75596   3939544   2% /dev/shm
tmpfs                 5120       4      5116   1% /run/lock
tmpfs              4015140       0   4015140   0% /sys/fs/cgroup
/dev/sda1           507904   69760    438144  14% /boot/efi
tmpfs               803028      76    802952   1% /run/user/1000
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ du
12       .
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ free
              total        used        free      shared  buff/cache   available
Mem:        8030280     1097312     5519448      290576     1413520     6383076
Swap:       2097148           0     2097148
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ whereis terminal
terminal:
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ which chrome
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ tar cf file.tar file
tar: file: Cannot stat: No such file or directory
tar: Exiting with failure status due to previous errors
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ tar cf file.tar file1
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ tar xf file.tar
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ tar czf file.tar.gz file1
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ tar xzf file.tar.gz
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ tar cjf file.tar.bz2 file1
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ tar xjf file.tar.bz2
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ gzip file
gzip: file: No such file or directory
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ gzip file1
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ gzip -d file.gz
gzip: file.gz: No such file or directory
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ gzip -d file1.gz
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ ping host
ping: host: Temporary failure in name resolution
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ whois domain

Command 'whois' not found, but can be installed with:

sudo apt install whois

jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$ dig domain

; <<>> DiG 9.11.3-1ubuntu1.3-Ubuntu <<>> domain
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: SERVFAIL, id: 46334
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;domain.                        IN      A

;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Thu Jan 31 01:12:49 IST 2019
;; MSG SIZE  rcvd: 35

jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/test_dir$
```

- SHELL PROGRAMS

```
echo 'enter a char'
read char
case $char in
        [0-9])echo 'you entered a num'
                ;;
        [a-z]) echo 'you enter a lower case alpha'
                ;;
        [A-Z]) echo'you entered a upper case alpha'
                ;;
        *) echo 'wtf mate?'
                ;;
esac
-------------------------------------------------
echo "enter choice"
echo "1. rever num"
echo "2. Convert to bin"
echo "3. fibonnaci"
read ch
case $ch in
        1)
        echo "enter num"
        read num
        rev=0
        while [ "$num" -gt "1" ]
        do
                temp=`expr $num % 10`
                rev=`expr $rev \* 10`
                rev=`expr $rev + $temp`
                num=`expr $num / 10`
        done
        echo $rev
        ;;

        2)
        echo "enter num"
        read num
        bin=0
        i=1
        while [ "$num" -gt "0" ]
        do
                d=`expr $num \% 2`
                t=`expr $i \* $d`
                bin=`expr $bin \+ $t`
                i=`expr $i \* 10`
                num=`expr $num / 2`
```

```
        done
        echo $bin
        ;;

        3)
        echo "num of terms"
        read n
        x=0
        y=1
        echo $x
        echo $y
        while [ "$n" -gt "2" ]
        do
                temp=`expr $x + $y`
                x=$y
                y=$temp
                echo $y
                n=`expr $n - 1`
        done
        ;;
esac
--------------------------------------------------
if [ $1 -gt 19 ]
then
        echo good night
elif [ $1 -gt 15 ]
then
        echo good even
elif [ $1 -gt 11 ]
then
        echo good afternoon
else
        echo good morn
fi
--------------------------------------------------
echo $# $*
shift
echo $# $*
shift
echo $# $*
--------------------------------------------------
echo "Enter choice"
echo "1 list of file"
echo "1 list of users"
echo "1 del file"
read ch
case $ch in
        1) echo "list is"
```

```
                'ls';;
        2) echo "users are"
                'who';;
        3) echo "enter file to del"
                read frame
                'rm' $frame;;
esac
--------------------------------------------------
#!/bin/sh
echo you have executed $0
echo you hvae $# parameters
echo first is $1
echo second is $2
echo `expr $1 + $2`
--------------------------------------------------
echo "Enter three num"
read a
read b
read c
if [ $a -gt $b -a $a -gt $c ]
then echo "$a is greatest"
elif [ $b -gt $c ]
then echo "$b is greatest"
else echo "$c is greatest"
fi
--------------------------------------------------
ch=y
while [ "$ch" != "n" ]
do
echo "Enter num"
read number
fact=1
while [ "$number" -gt "1" ]
do
fact=`expr $fact \* $number`
number=`expr $number \- 1 `
done
echo "factorial is $fact"
echo "more?"
read ch
done
```

```
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/shell_commands$ sh case.sh
enter a char
b
you enter a lower case alpha
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/shell_commands$ sh complex_prog_much.sh
enter choice
1. rever num
2. Convert to bin
3. fibonnaci
3
num of terms
5
0
1
1
2
3
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/shell_commands$ sh if_states.sh 15
good afternoon
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/shell_commands$ sh shift.sh 1 2 3
3 1 2 3
2 2 3
1 3
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/shell_commands$ sh switch_case.sh
Enter choice
1 list of file
2 list of users
3 del file
2
users are
jkt        tty7          2019-01-30 16:39 (:0)
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/shell_commands$ sh test.sh 1 3
you have executed test.sh
you hvae 2 parameters
first is 1
second is 3
4
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/shell_commands$ sh three_num_comp.sh
Enter three num
1
4
2
4 is greatest
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/shell_commands$ sh while_prog.sh
Enter num
3
factorial is 6
more?
y
Enter num
4
factorial is 24
more?
n
jkt@jkt-pc:~/Documents/OS_LAB/17BCE7106/shell_commands$
```

- SYSTEM CALL PROGRAMS
  - Program 1

```c
//open a file using c prog
#include<fcntl.h>
#include<errno.h>
#include<stdio.h>
int main(int argc, char** argv){
        int fd;
        fd = open("test.txt", O_RDONLY);
        printf("%d\n", fd);
        if(fd == -1){
                fprintf(stderr, "Error Occured %d\n", errno);
                perror("Program");
        }else{
                printf("file opened\n");
        }
        close(fd);
        return 0;
}
```

  - Program 2

```c
//writing to a file
#include<fcntl.h>
#include<errno.h>
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
int main(int argc, char** argv){
        int fd, sz;
        fd = open("test2.txt", O_RDWR | O_CREAT | O_APPEND, 0644);
        if(fd<0){
                perror("r1");
                exit(1);
        }
        sz = write(fd, "writing to file\n", strlen("writing to file\n"));
        printf("called write()\n");
        close(fd);
        return 0;
}
```

  - Program 3

```c
//read a file using c prog
#include<fcntl.h>
#include<errno.h>
#include<stdio.h>
#include<stdlib.h>
int main(int argc, char** argv){
        char* c;
        int sz, fd;
        c = (char*)malloc(100*sizeof(char));

        fd = open("test2.txt", O_RDONLY);
        if(fd == -1){
                fprintf(stderr, "Error Occured %d\n", errno);
```

```
                perror("Program");
                exit(1);
        }

        sz = read(fd, c, 100);
        printf("called read(%d, c, 100), which read %d bytes \n", fd, sz);
        //c[sz]='\0';
        printf("thoese bytes are as follows: %s\n", c);
        close(fd);
        return 0;
}
```

○ Program 4

```
#include<stdlib.h>
#include<stdio.h>
void fn1(){
        printf("fn1\n");
}
void fn2(){
        printf("fn2\n");
}
int main(){
        atexit(fn1);
        atexit(fn2);
        return 0;
}
```
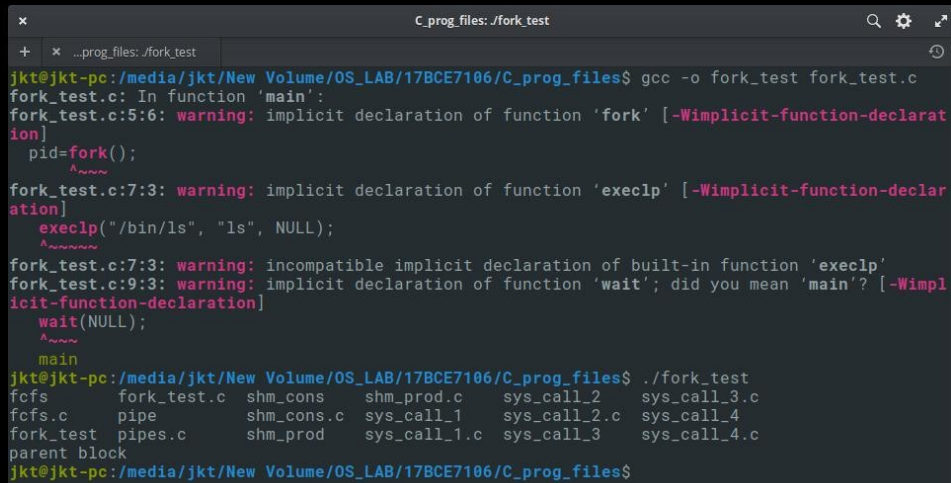
```
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ ./sys_call_1
3
file opened
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ ./sys_call_2
called write()
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ ./sys_call_3
called read(3, c, 100), which read 16 bytes
thoese bytes are as follows: writing to file

jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ ./sys_call_4
fn2
fn1
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$
```

- FORK PROGRAM

```c
#include<sys/types.h>
#include<stdio.h>
int main(){
        pid_t pid;
        pid=fork();
        if(pid==0){
                execlp("/bin/ls", "ls", NULL);
        }else{
                wait(NULL);
                printf("parent block\n");
        }
        return 0;
}
```

- PIPE PROGRAM

```c
#include<sys/types.h>
#include <stdio.h>
#include <unistd.h>
#include <string.h>
#include<stdlib.h>
int main(){
        int buf_size = 50;
        int read_end = 0;
        int write_end = 1;
        char w_msg[] = "hello world";
        char r_msg[buf_size];
        int fd[2];
        if(pipe(fd)==-1){
                fprintf(stderr, "PIPE FAILED\n");
        }

        pid_t pid;
        pid = fork();
        if(pid<0){
                fprintf(stderr, "FORK FAILED\n");
        }else if(pid == 0){
                close(fd[read_end]);
                write(fd[write_end], w_msg, strlen(w_msg)+1);
                close(fd[write_end]);
                exit(0);
        }else if (pid > 0){
                close(fd[write_end]);
                read(fd[read_end], r_msg, buf_size);
                printf("%s\n", r_msg);
                close(fd[read_end]);
        }
        return 0;
}
```

```
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ gcc -o pipe pipes.c
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ ./pipe
hello world
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$
```

- SHARED MEMEORY PROGRAM
  - Producer Code

```
#include<stdio.h>
#include<stdlib.h>
#include<fcntl.h>
#include<sys/mman.h>
#include <sys/shm.h>
#include <sys/stat.h>
int main(){
        int size = 4096;
        char *name = "OS";
        char *msg = "hello world";
        int shm_fd;
        void *ptr;
        shm_fd = shm_open(name, O_CREAT|O_RDWR, 0666);
        ftruncate(shm_fd, size);
        ptr = mmap(0, size, PROT_WRITE, MAP_SHARED, shm_fd, 0);
        sprintf(ptr, "%s", msg);
        return 0;
}
```

  - Consumer Code

```
#include<stdio.h>
#include<stdlib.h>
#include<fcntl.h>
#include<sys/mman.h>
#include <sys/shm.h>
#include <sys/stat.h>
int main(){
        int size = 4096;
        char *name = "OS";
        char *msg = "hello world";
        int shm_fd;
        void *ptr;
        shm_fd = shm_open(name, O_RDONLY, 0666);
        ftruncate(shm_fd, size);
        ptr = mmap(0, size, PROT_READ, MAP_SHARED, shm_fd, 0);
        printf("%s\n", (char*)ptr);
        return 0;
}
```

```
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ gcc -o shm_prod shm_prod.c -lrt
shm_prod.c: In function 'main':
shm_prod.c:14:2: warning: implicit declaration of function 'ftruncate' [-Wimplicit-function-dec
laration]
  ftruncate(shm_fd, size);
  ^~~~~~~~~
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ gcc -o shm_cons shm_cons.c -lrt

shm_cons.c: In function 'main':
shm_cons.c:14:2: warning: implicit declaration of function 'ftruncate' [-Wimplicit-function-dec
laration]
  ftruncate(shm_fd, size);
  ^~~~~~~~~
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ ./shm_prod
jkt@jkt-pc:/media/jkt/New Volume/OS_LAB/17BCE7106/C_prog_files$ ./shm_cons
hello world
```