IT215_Systems_Software_march2022

Question-Wise Details

Section 1
Section #1

40	55m 45s	16.3/60
question(s)	Time taken	Marks Scored

Q. 1

Question 1

Time taken: 2m 45s

Marks Scored: 1/1

Assume that file1.txt contains following data. What will the file content after the execution of the code as shown.

Content of file1.txt:
12345abcde67890fghij
	char buf1[100];
	int fd1 = open("file1.txt", O_RDWR);
	read(fd1, buf1, 10);
	int fd2 = open("file1.txt", O_RDWR);
	write(fd2, buf1, 10);

Response:

OPTIONS	RESPONSE	ANSWER
None of the above		
1234567890abcdefghij		
12345abcde67890fghij	✓	✓
12345abcde12345abcde		
abcdefghij1234567890		

Q. 2

Question 2

Time taken: 2m 27s

Marks Scored: 1.33/2

We want to concatenate two files, file1.txt and fil2.txt and create a new file, new.txt, with the concatenated content. Which of the following commands will be able to perform this? (NOTE: There can be more than one correct answer)

Response:

OPTIONS	RESPONSE	ANSWER
for i in {1..2}; do cat "file$i.txt" >> new.txt; done	✓	✓
find . -type f -name 'file?.txt' -exec cat {} + >> new.txt		✓
cp file1.txt file2.txt > new.txt		
cat file1.txt file2.txt > new.txt	✓	✓
cat file1.txt file2.txt | new.txt		

Q. 3

Question 3

Not Attempted

Assume that the parent process runs with pid=10 and the child process runs with pid=11. Select all possible outputs expected when a parent.out is executed with any integer value passed as a command-line argument?

```
//parent.c
int main( int argc, char* argv[] )
{
        int i, childPID, status;
        if ( fork() == 0 ) /* Child */
        {
                strcpy(argv[0], "./child.out");
                execv( "./child.out", &argv[0] );
        }
        else
        {
                childPID = wait(&status);
                printf("%d\n",
childPID+WEXITSTATUS(status));

        }
}
```

```
//child.c
int main(int argc, char* argv[])
{
        int num=atoi(argv[1]);
        if (num<=5)
                exit(0);
        else if (num>5 && num<10)
                exit(5);
        else
                exit(10);
}
```

Response:

OPTIONS	RESPONSE	ANSWER
0		
20		✓
5		
10		✓
15		✓

Q. 4

Question 4

Time taken: 52s

Marks Scored: 1/1

What will be the output from the code below?

```
main()
{
        int a[10]={9,8,7,6,5,4,3,2,1,0};
        int *p=&a[5];
        print("%d", a[p[0]]);
}
```

Response:

OPTIONS	RESPONSE	ANSWER
None of the above		
5	✓	✓
Segmentation fault error		
Compilation error		
4		

Q. 5

Question 5

Time taken: 42s

Marks Scored: -0.5/1

Following program is compiled as a.out and being executed on the terminal window, how many times a.out will be executed in total, including the one you run on the terminal window?

```
int main()
{
    while(1)
    {
        fork();
        execl("./a.out", "./a.out", NULL);
    }
}
```

Response:

OPTIONS	RESPONSE	ANSWER
2 times	✓	
4 times		
None of the above		✓
1 time		
3 times		

Q. 6

Question 6

Not Attempted

What is expected when the following code is executed?

```
main()
{
        int fd;
        char *str="write large data to a file using this string";
        fd = open("file.txt",O_WRONLY);
        fork();
        write(fd,str,strlen(str));
}
```

Response:

OPTIONS	RESPONSE	ANSWER
Compilation error		
None of the above		
Deadlock occurs		
Race condition occurs		✓
Runtime error		

Q. 7

Question 7

Not Attempted

What is expected when the following commands are executed?

```
ln -s sln1 file.txt
ln -s sln2 sln1
cat sln2
```

Response:

OPTIONS	RESPONSE	ANSWER
ln -s sln2 sln1 will result in an error		
cat sln2 result in an error since we cannot use softlink of softlink		
cat sln2 result in an error since we cannot use softlink directly to view the file content		
None of the above		
Content of file.txt will be displayed in stdout		✓

Q. 8

Question 8

Time taken: 2m 5s

Marks Scored: 0.67/2

While executing a.out a user is getting an error "error while loading shared libraries", how can this error be fixed?

Response:

OPTIONS	RESPONSE	ANSWER
Adding a directory containing shared library to PATH environment variable	✓	
Provide full path while running a.out e.g. ~/project/a.out	✓	
Add a new configuration file in /etc/ld.so.conf.d folder with path to shared directory and load it using ldconfig		✓
Copy shared library to /usr/lib		✓
Create LD_LIBRARY_PATH environment variable with full path to shared library	✓	✓

Q. 9

Question 9

Time taken: 1m 25s

Marks Scored: 2/2

Select the true statements about the code snippet given below.

```
// code1.c
#define max(a,b) a>b?a:b
```

```
// code2.c
int max(int a, int b) {return a>b?a:b;}
```

Response:

OPTIONS	RESPONSE	ANSWER
Preprocessor will process max(int a, int b) in code2.c		
None of the above		
Compiler will process max(int a, int b)in code2.c	✓	✓
Preprocessor will process max(a,b) in code1.c	✓	✓
Compiler will process max(a,b)in code1.c		

Q. 10

Question 10

Time taken: 50s

Marks Scored: 1/1

The correct sequence of the GCC compilation process is

Response:

OPTIONS	RESPONSE	ANSWER
Preprocessing-Assembling-Compiling-Linking		
None of the above		
Assembling-Preprocessing-Compiling-Linking		
Compiling-Preprocessing-Assembling-Linking		
Preprocessing-Compiling-Assembling-Linking	✓	✓

Q. 11

Question 11

Not Attempted

Consider the assembly code snippet of main() and func1() functions. Select all the true statements about the code?

```
0000000000001070 <func1@plt>:
   1070:        f3 0f 1e fa             endbr64
   1074:        f2 ff 25 45 2f 00 00    bnd jmp QWORD PTR [rip+0x2f45]      # 3fc0 <func1>
   107b:        0f 1f 44 00 00          nop    DWORD PTR [rax+rax*1+0x0]
0000000000001189 <main>:
   1189:        f3 0f 1e fa             endbr64
   118d:        55                      push   rbp
     ....
   11c8:        e8 a3 fe ff ff          call   1070 <func1@plt>
   ....
   122f:        c9              leave
   1230:        c3              ret
```

Response:

OPTIONS	RESPONSE	ANSWER
func1() function is defined a dynamic library linked with application with main() function		✓
func1() function is defined in a separate object file but not linked with application with main() function		
None of the above		
func1() function is defined a static library linked with application with main() function		
func1() function is defined in the same file as main()		

Q. 12

Question 12

Not Attempted

What are all possible functions of linker?

Response:

OPTIONS	RESPONSE	ANSWER
Finds address from the function definition in all object files and provide it for CALL		✓
Convert assembly code into binary object code		
Links functions called from object files defined in static or dynamic library file to build executables		✓
Embed the function code from static library in executable file		✓
Expand all header files		

Q. 13

Question 13

Time taken: 2m 16s

Marks Scored: 1/1

List out the process states in the same order the child process goes through when the following code gets executed.

int main()

```
{
        if (fork() == 0)
        {
                int fd; char buf[100000]
                fd = open("large.txt",O_RDONLY);
                read(fd,buf,len(buf));
                exit(10)
        }
        else
        {
                while(1)
                        sleep(5*60);
        }
}
```

Response:

OPTIONS	RESPONSE	ANSWER
Idle-Runnable-Running-Suspended-Runnable-Running-Terminated		
Idle-Runnable-Running-Sleeping-Runnable-Running-Terminated		
None of the above		
Idle-Runnable-Running-Sleeping-Runnable-Running-Zombified-Terminated	✓	✓
Idle-Runnable-Running-Suspended-Runnable-Running-Zombified-Terminated		

Q. 14

Question 14

Not Attempted

Assume that file1.txt contains following data. What will be all possible content after the execution of the code as shown. (Note: Assume that read and write operations are atomic, which mean all 10 bytes will be read at the same time or written at the same time).

Content of file1.txt:
abcde12345fghij67890
	char buf1[100]=”abcdefghijklmnopqrst”;
	int fd1 = open(“file1.txt”, O_RDWR);
	int pid = fork();
	if (pid == 0)
	read(fd1, buf1, 10);
	else
	write(fd1, buf1, 10);

Response:

OPTIONS	RESPONSE	ANSWER
abcde12345fghij67890		
None of the above		
1234567890abcdefghij		
abcde12345abcde12345		✓
abcdefghijfghij67890		✓

Q. 15

Question 15

Time taken: 2m 43s

Marks Scored: -0.5/1

A user with id sysuser executes and script2.sh terminal window. What will be the expected output from the script?

```
cd $HOME
pwd=`pwd`
cd project/module
pwd=`pwd`
cd ..
cd $pwd
cd .
```

Response:

OPTIONS	RESPONSE	ANSWER
current directory is /home/sysuser/project/module		✓
None of the above		
current directory is /home/sysuser/project	✓	
script results in an error		
current directory is a home directory /home/sysuser		

Q. 16

Question 16

Not Attempted

Lets assume libb.so and libb.a are created from b.o with function fn() having 75 bytes of binary code. What is the expected executable (a.out) file size when a.o is 125 bytes and following command is executed?

gcc -o a.out a.o ./libb.a

Response:

OPTIONS	RESPONSE	ANSWER
125 bytes		
75 bytes		
None of the above		
0 bytes		
200 bytes		✓

Q. 17

Question 17

Not Attempted

Considering File Control Block (FCB) supports 10 direct pointers, 3 single indirect pointers, 3 double indirect pointers and 1 triple indirect pointers. Calculate the maximum size of the file supported by

Response:

OPTIONS	RESPONSE	ANSWER
541076KB		✓
None of the above		
524288KB		
384KB		
16384KB		

Q. 18

Question 18

Not Attempted

Considering the following content of the makefile, which of the targets will be build when make command is executed?

```
CC=gcc
%.o: %.c
        $(CC) -c -o $@ $^
libmylib.a: abc.o def.o
        ar rs $@ $<
myapp.out: myapp.o
$(CC) -o $@ $<
```

Response:

OPTIONS	RESPONSE	ANSWER
An executable myapp.out, a library libmylib.a and three object files myapp.o, abc.o and def.o		
Only two object files abc.o and def.o		
Library libmylib.a and two object files abc.o and def.o		
Library libmylib.a and three object files myapp.o, abc.o and def.o		✓
Only three object files myapp.o, abc.o and def.o		

Q. 19

Question 19

Time taken: 37s

Marks Scored: -1/2

How many times will the "ls" command be executed?

```
int main()
{
    fork() || fork();
    execlp("ls", "ls", NULL);
}
```

Response:

OPTIONS	RESPONSE	ANSWER
3 times		
1 time		
None of the above		
2 times	✓	
4 times		✓

Q. 20

Question 20

Not Attempted

How many times will the "ls" command be executed?

```
int main()
{
    fork();
    fork();
    execlp("ls", "ls", NULL);
    if (fork()==0)

        execlp("ls", "ls", NULL);
}
```

Response:

OPTIONS	RESPONSE	ANSWER
6 times		
None of the above		
2 times		
4 times		✓
8 times		

Q. 21

Question 21

Time taken: 1m 20s

Marks Scored: 2/2

When OS needs to context switch a process, which of the following information is saved by OS? So that when the process is ready to run again, it starts from where it was left off.

Response:

OPTIONS	RESPONSE	ANSWER
Stack Pointer	✓	✓
Program Code		
Program counter	✓	✓
Processor Status Word	✓	✓
Data Area		

Q. 22

Question 22

Not Attempted

How many times will the "ls" command be executed?

```
int main()
{
    If (fork() > 0)
    {
        fork();
        execlp("ls", "ls", NULL);
    }
    fork();
    execlp("ls", "ls", NULL);
    fork();
}
```

Response:

OPTIONS	RESPONSE	ANSWER
8 times		
None of the above		
4 times		✓
2 times		
6 times		

Q. 23

Question 23

Not Attempted

What are all possible outputs expected from the code below?

```
int main()
{
    int a=5,b=10;
    if (fork() == 0)
    {
        a = a*2;
        b = b*2;
    }
    printf("a=%d\n",a);
    printf("b=%d\n",b);
}
```

Response:

OPTIONS	RESPONSE	ANSWER
a=5 b=10 a=10 b=20		✓
a=10 a=5 b=20 b=10		✓
b=10 a=10 b=20 a=5		
a=5 a=10 b=10 b=20		✓
b=10 b=20 a=10 a=5		

Q. 24

Question 24

Time taken: 1m 27s

Marks Scored: 1.33/2

What can you say about path1 and path2 when the following condition is true, assuming get_inode(char *path) returns inode number of a file or a directory?
get_inode(path1) == get_inode(path2)

Response:

OPTIONS	RESPONSE	ANSWER
path1 and path2 are exactly the same string	✓	✓
path1 has a value /. and path2 have a value /..	✓	✓
path1 and path2 are hardlinks for the same file/directory		✓
path1 and path2 are parent and child directories	✓	
path1 is soft link pointing to path2		

Q. 25

Question 25

Time taken: 1m 39s

Marks Scored: 1/1

What will be the output of the following script script.sh when command line argument passed is 123456?

```
n=$1
a=0
b=0
while [ $n -gt 0 ]
   do
   b=`expr $n % 10`
   a=`expr $a \* 10  + $b`
   n=`expr $n / 10`
done
echo $a
```

Response:

OPTIONS	RESPONSE	ANSWER
654321	✓	✓
321456		
Script results in an error		
None of the above		
123456		

Q. 26

Question 26

Not Attempted

Lets assume libb.so and libb.a are created from b.o with function fn() having 75 bytes of binary code. What is the expected executable (a.out) file size when a.o is 125 bytes and following command is executed?
gcc -o a.out a.o -L . -lb

Response:

OPTIONS	RESPONSE	ANSWER
125 bytes		
75 bytes		
200 bytes		
0 bytes		
None of the above		✓

Q. 27

Question 27

Time taken: 2m 10s

Marks Scored: -0.5/1

What will be the output when calling.sh shell script is executed?

// Program called.c has executable
called.out
int main() {
int i=1;
exit(i);
}
	#!/bin/bash
	# Filename:
	calling.sh
	./called.out
	echo $?
	echo $?

Response:

OPTIONS	RESPONSE	ANSWER
None of the above		
1 0		✓
1 1	✓	
0 1		
0 0		

Q. 28

Question 28

Not Attempted

Assume that file1.txt contains following data. What is expected after the execution of the code as shown.

Content of file1.txt:
abcde12345fghij67890
	char buf1[100]="abcdefghijklmnopqrst";
	int pid = fork();
	if (pid == 0) {
	int fd1 = open("file1.txt", O_RDWR);
	read(fd1, buf1, 10); }
	else {
	int fd2 = dup(fd1);
	write(fd2, buf1, 10); }

Response:

OPTIONS	RESPONSE	ANSWER
Compilation error		✓
System-wide file open table has two fds with reference count of 2		
Runtime error		
Parent and Child process will have file descriptor tables with 2 fds each		
File content remain unchanged		✓

Q. 29

Question 29

Not Attempted

Assume that file1.txt contains following data. What will the file content after the execution of the code as shown.

Content of file1.txt:
12345abcde67890fghij
	char buf1[100];
	int fd1 = open("file1.txt", O_RDWR);
	read(fd1, buf1, 10);
	int fd2 = dup(fd1);
	write(fd2, buf1, 10);

Response:

OPTIONS	RESPONSE	ANSWER
12345abcde12345abcde		✓
1234567890abcdefghij		
abcdefghij1234567890		
None of the above		
12345abcde67890fghij		

Q. 30

Question 30

Not Attempted

Considering the following content of the makefile, which of the targets will be build when "make all" command is executed?

```
CC=gcc
%.o: %.c
        $(CC) -c -o $@ $^
libmylib.a: abc.o def.o
        ar rs $@ $<
myapp.out: myapp.o
$(CC) -o $@ $<
.phony: all
all: myapp.out libmylib.a
```

Response:

OPTIONS	RESPONSE	ANSWER
Only two object files abc.o and def.o		
Only three object files myapp.o, abc.o and def.o		
An executable myapp.out, a library libmylib.a and three object files myapp.o, abc.o and def.o		✓
Library libmylib.a and three object files myapp.o, abc.o and def.o		
Library libmylib.a and two object files abc.o and def.o		

Q. 31

Question 31

Time taken: 2m 52s

Marks Scored: 1/2

A user executes the script.sh consisting of following commands on the terminal window, which of the following statements are true?

var1=1

var2=2

export var1

bash script1.sh

Response:

OPTIONS	RESPONSE	ANSWER
script1.sh has different process id than script.sh	✓	✓
var1 and var2 both are local variables for the script.sh and are inaccessible to child shell as well as script1.sh		
Only var1 is accessible both in child shell and in script1.sh		✓
Only var1 is accessible in child shell but not accessible in script1.sh		
var1 and var2 both are accessible in child shell and script1.sh	✓	

Q. 32

Question 32

Time taken: 3m 12s

Marks Scored: 1/2

When preprocessing step is executed for the code below, which of the following statements are true?

```
#include <stdio.h>
int main()
{
   #ifdef PI
      printf("%f",PI);
   #else
      float pi=3.14;
   #endif
   return 0;
}
```

Response:

OPTIONS	RESPONSE	ANSWER
Preprocessed file will contain float pi=3.14		✓
Preprocessing step results in error due to the constant and variable defined with the same name pi		
Preprocessed file will contain printf("%f",3.14)	✓	
Assembly code is generated after preprocessing step		
Forward declaration of printf will be included in the preprocessed file	✓	✓

Q. 33

Question 33

Time taken: 3m 1s

Marks Scored: 0.67/2

When ls -i is executed following output is generated, what can you say about the output?
1000 file1.txt
1000 file2.txt
1001 file3.txt → file1.txt

Response:

OPTIONS	RESPONSE	ANSWER
file1.txt and file2.txt have same inode numbers so they are softlinks		

struct stat s;
stat("file1.txt",&s);
printf("%d",s.st_nlinks);
will print the value 2
		✓

file1.txt and file2.txt have same inode numbers so they are hardlinks	✓	✓
If we delete file1.txt, we can still get the content of the same file by executing cat file2.txt		✓
If we delete file1.txt, we can still get the content of the same file by executing cat file3.txt	✓	

Q. 34

Question 34

Time taken: 56s

Marks Scored: 0.8/2

Which of the following command will redirect the standard output (stdout)?

Response:

OPTIONS	RESPONSE	ANSWER
>>	✓	✓
|		✓
>		✓
2>&1		✓
1>	✓	✓

Q. 35

Question 35

Not Attempted

What is the expected behavior of the processes executing the code shown below?

```
int main()
{
        int status;
        fork();
        wait(&status);
}
```

Response:

OPTIONS	RESPONSE	ANSWER
Both parent and child terminates normally		
None of the above		
The parent process terminates normally, but the child process is blocked		
The child process terminates normally, but the parent process is blocked		
Both parent and child are blocked		✓

Q. 36

Question 36

Not Attempted

What will be the output of the following command?
echo $$$$$?

Response:

OPTIONS	RESPONSE	ANSWER
<pid><pid>0		✓
None of the above		
Script results in an error		
$<pid><pid>?		
<pid>$?		

Q. 37

Question 37

Not Attempted

How many times will the "ls" command be executed?

```
int main()
{
    fork() && fork() && fork();
    execlp("ls", "ls", NULL);
}
```

Response:

OPTIONS	RESPONSE	ANSWER
3 times		
4 times		
5 times		✓
1 time		
2 times		

Q. 38

Question 38

Not Attempted

Assume that file1.txt contains following data. At the end of execution of the following, select all the possible options with entries in parent process open file table (PPO), entries in child process open file table (CPO), entries in system-wide file open table (SWO) with offset (OFF) and reference count (REF).

Content of file1.txt:
abcde12345fghij67890
	char buf1[100]="abcdefghijklmnopqrst";
	int fd1 = open("file1.txt", O_RDWR);
	int pid = fork();
	if (pid == 0) {
	read(fd1, buf1, 10); }
	else {
	int fd2 = dup(fd1);
	write(fd2, buf1, 10); }

Response:

OPTIONS	RESPONSE	ANSWER
PPO=fd1,CPO=(fd1,fd2),SWO=fd1(OFF=20,REF=2)		
PPO=fd1,CPO=(fd1,fd2),SWO=fd1(OFF=20,REF=3)		✓
PPO=fd1,CPO=(fd1,fd2),SWO=fd1(OFF=10,REF=1), SWO=fd2(OFF=10,REF=2)		
PPO=fd1,CPO=(fd1,fd2),SWO=fd1(OFF=10,REF=2), SWO=fd2(OFF=10,REF=1)		
PPO=fd1,CPO=fd2,SWO=fd1(OFF=10,REF=1), SWO=fd2(OFF=10,REF=1)		

Q. 39

Question 39

Time taken: 2m 15s

Marks Scored: 2/2

Upon executing ~/project/a.out, a user gets a "command not found" error. What are the possible solutions to resolve the error?

Response:

OPTIONS	RESPONSE	ANSWER
Provide the full path while executing a.out	✓	✓
Copy a.out to /usr/local/bin directory	✓	✓
Add ~/project to a PATH environment variable	✓	✓
Provide executable permission to a.out for the current user		
None of the above		

Q. 40

Question 40

Time taken: 3m 9s

Marks Scored: 1/1

All users get a "Permission Denied" error while executing a.out executable. Which of the following commands will you execute to fix the error?

Response:

OPTIONS	RESPONSE	ANSWER
chmod 550 a.out		
chmod 555 a.out	✓	✓
chmod 500 a.out		
chown <uid> <groupid> a.out		
chmod 000 a.out		