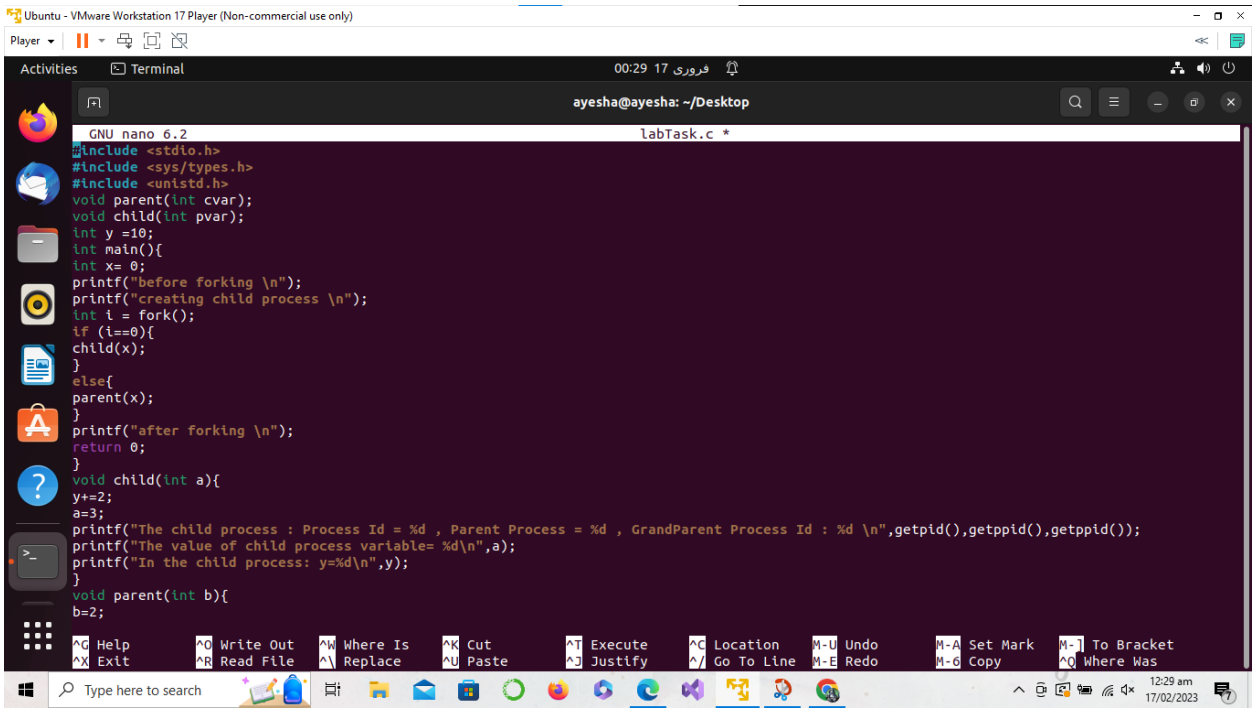
Question no 1:

Code :



Output:

```
before forking
creating child process
The parent process: Process Id = 6917, Parent Process Id =2359THe value of parent process variablel = 2
in the child process: y=15
after forking
The child process : Process Id = 6918 , Parent Process = 6917 , GrandParent Process Id : 6917
The value of child process variable= 3
In the child process: y=12
after forking
```

Question no 2:

Code :

```
  GNU nano 6.2                          labTask.c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>

int main() {
   int i, pid[3];
    // create 3 children
        pid[0]=fork();
        if(pid[0]==0){
        printf("Child 1 with pid %d is created\n",getpid());
sleep(2);
printf("Child 1 with pid %d is terminated\n",getpid());
exit(0);
}
        pid[1]=fork();
        if(pid[1]==0){
        printf("Child 2 with pid %d is created\n",getpid());
printf("Child 2 with pid %d is terminated\n",getpid());
exit(0);
}
        pid[2]=fork();
        if(pid[2]==0){
        printf("Child 3 with pid %d is created\n",getpid());
printf("Child 3 with pid %d is terminated\n",getpid());
exit(0);
}

    // parent process
sleep(1);
```

```
    // parent process
sleep(1);
    printf("Parent process with pid %d is waiting for children t>
    for (i = 0; i < 3; i++) {
        waitpid(pid[i], NULL, 0); // wait for each child to exit
    }
    printf("Parent process with pid %d is terminating\n", getpid>
    exit(0);
}
```

Output :

```
ayesha@ayesha:~/Desktop$ ./lab
Child 1 with pid 9405 is created
Child 3 with pid 9407 is created
Child 3 with pid 9407 is terminated
Child 2 with pid 9406 is created
Child 2 with pid 9406 is terminated
Parent process with pid 9404 is waiting for children to exit
Child 1 with pid 9405 is terminated
Parent process with pid 9404 is terminating
```

Question no 3:

fork() creates a new process by duplicating the calling process, while exec() replaces the current process with a new process image. fork() creates a child process with the same memory state as the parent process, while exec() loads a new executable file into the current process's address space and runs it. Together, fork() and exec() are often used to create a new process and then replace it with a different program.

Question no 4:

```
ayesha@ayesha:~/Desktop$ ./lab | grep -c "Hello"
17976
```

Question no 5:

```
ayesha@ayesha:~/Desktop$ pkill -9 -f ./lab
ayesha@ayesha:~/Desktop$ ps -al
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S  1000    1629    1621  0  80   0 - 58008 do_pol tty2     00:00:00 gnome-session-b
4 R  1000   54850    9841  0  80   0 -  5419 -      pts/0    00:00:00 ps
ayesha@ayesha:~/Desktop$
```

Question no 6:

Exit System Call:
The exit() system call is used to terminate a program and return an exit status to the parent process or the operating system. It takes a single argument, which is the exit status of the program. The exit status is a number between 0 and 255, where 0 indicates successful termination and any other value indicates an error or abnormal termination.
Example:

Program 1: Normal Termination

This program simply prints a message and exits with a status of 0, indicating successful termination:

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

int main() {
    printf("Program has ended successfully.\n");
    exit(0);
}
```

Program 2: Abnormal Termination

This program attempts to open a non-existent file and exits with a status of 1, indicating an error:

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

int main() {
    FILE *fp = fopen("non_existent_file.txt", "r");
    if (fp == NULL) {
        printf("Error: Could not open file.\n");
        exit(1);
    }
    fclose(fp);
    return 0;
}
```