

Course Code: CS2006	Course Name: Operating Systems
Instructor Name: Dr. Ghufraan Ahmed	Issue Date: Mar 13, 2023
Assignment no. 02	Due Date: Mar 20, 2023

**Instructions:**

- Assignment should be solved handwritten on paper and their scanned soft copies are to be submitted on GCR.
- Must write your NU id on the top of each page of the assignment.
- Rough work must be solved for the clarification of the answer.
- Prints of Soft copy documented assignment cost direct zero.

**Q1. What is the output of the program below, give the reason of why wait(NULL) is used?**  
**/2.5**

```
#include <sys/types.h>
#include <stdio.h>
#include <unistd.h>
int value = -5;
int main()
{
    pid_t pid;
    pid = fork();
    if (pid == 0) {
        printf("Child: value = %d", value);
        value += 5;
        return 0;
    }
    else if (pid > 0) {
        wait(NULL);
        printf("PARENT: value = %d", value);

        return 0;
    }
}
```

Q2.

a. Write a program to declare a counter variable initialized by zero. After fork() system call two processes will run in parallel both incrementing their own version of counter and print numbers 1 -5. After printing numbers child process will sleep for three second, then print process id of its grandparent and terminates by invoking a gedit editor. Meanwhile, its parent waits for its termination.

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b. Consider the following program code. Answer the following questions:

/2.5

```

1 #include <sys/types.h>
2 #include <sys/wait.h>
3 #include <stdio.h>
4 #include <unistd.h>
5 #define SIZE 5
6 int nums[SIZE] = {0,1,2,3,4};
7 int main() {
8     int i;
9     pid_t pid;
10    pid = fork();
11    if (pid == 0) {
12        for (i = 0; i < SIZE; i++) {
13            nums[i] *= -i;
14            printf("%d \n",nums[i]); /* LINE X */
15        }
16    }
17    else if (pid > 0) {
18        wait(NULL);
19        execlp("/bin/date","date",NULL);
20        printf("%d \n",getpid()); /* LINE Y */
21    }
22    return 0;
23 }

```

1- Identify ONLY the system call(s) with line number(s).

2- What will be the output of the code?

3- What will be the output if we remove the wait (NULL) command from line 18?

4- Which lines of code will be executed by the child process and the parent process?

5- When will "LINE Y" be printed?

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Q3.

a. Determine if the following problems exhibit task/data parallelism or both. Give reasons in one or two lines each:

I. Transpose a matrix in parallel.

II. Calculating the salary of all employees of a company.

III. Taking input from IoT cameras in FAST for single abnormal event detection.

IV. Taking input from IoT cameras in library for scene detection (e.g., books, students, blackboard, teacher. detection modules working in parallel for classroom scene detection.

V. National ID card-making procedure at multiple counters of NADRA.

b. ABC is a software industry-made app for machine tool design that can be run 35% parallel on an 8 cores machine. The client needs more speed, ABC redesigns the app that can run on 16 cores with 40% parallel code. Discuss the speedup difference.

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Q4. Write a program which make 4 threads. Each thread will print one table out of [5678] up to 1000.

/5

Q5.

/5

A.

Consider a system that has a CPU-bound process, which requires a burst time of 25 seconds. The multilevel Feedback Queue scheduling algorithm is used with TQ=2 sec and in each level, it is incremented by 5 sec. Then how many times the process will be interrupted, and in which queue the process will terminate the execution?

B.

Explain the processor affinity?

C.

Discuss in detail about Load balancing in an operating system.