

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

WINTER SEMESTER, 2020-2021

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4501: Operating Systems

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **3 (three)** questions. Answer all of them.

Figures in the right margin indicate marks.

File naming format: **“Student ID_C4501M.pdf”**

- | | | | |
|----|----|--|--|
| 1. | a) | What is Context Switch? What entity is required to represent a process in the OS? Describe the process of Context Switching with appropriate process timeline diagram. | 2 + 1 + 5
(CO1, CO2)
(PO1, PO4, PO10, PO12) |
| | b) | Explain how interrupt driven I/O operation is accomplished. For transferring large amount of data is there any alternative to interrupt driven approach? If yes, how does it work and what are its benefits? | 4 + 1 + 3
(CO1, CO2, CO3)
(PO1, PO4, PO10, PO12) |
| | c) | Write short notes on the following | 3 × 3
(CO1, CO3)
(PO1, PO4, PO10, PO12) |
| | | i. Graceful degradation.
ii. Thread pool.
iii. Thread cancellation. | |
| 2. | a) | <i>“All Orphan processes are Zombie processes but all Zombie processes are not Orphan processes.”</i> - Explain with appropriate scenario and process timeline diagram. | 7
(CO1, CO3)
(PO1, PO4, PO10, PO12) |
| | b) | Suppose you have a list of n numbers and your workstation has 4 processing cores. Now, consider the following two scenarios- | |

Scenario I-

You **divide** the list of numbers in **two equal halves**. For the numbers in the **first half**, you have to find their **summation** and for those in the **second**, you have to find their **product**. Finally, you have to find the **difference** between the **summation** and the **product**.

Scenario II-

You have to find the **difference** between the **summation** and the **product** of **all the numbers** in the list.

Answer the following questions-

- | | | |
|------|--|--|
| i. | How will you utilize all the processing cores in each of these scenarios? Explain separately. | 3 |
| ii. | What type of parallelism will you implement in each of these scenarios? Justify your answer. | 3 |
| iii. | Given 4 processing cores, will you get the same computational gain in both scenarios? Explain mathematically using Amdahl's law. | 12 |
| | | (CO1, CO2, CO3, CO4,
CO5)
(PO1, PO2, PO4, PO10,
PO12) |

```

#include <sys/types.h>
#include <stdio.h>
#include <unistd.h>

#define SIZE 5

int nums = {0, 1, 2, 3, 4};

int main(){
    int i;
    pid_t pid;

    pid = fork();

    if(pid == 0){
        for(i = 0; i < SIZE; i++){
            nums[i] *= -i;
            printf("%d ", nums[i]); /* LINE A */
        }
    }
    else if(pid > 0){
        wait(NULL);
        for(i = 0; i < SIZE; i++){
            printf("%d ", nums[i]); /* LINE B */
        }
    }
}

```

Code Listing 1

3. a) Using the program in **Code Listing 1**, generate the outputs at **LINE A** and **LINE B**.
In which program space will **LINE A** be executed, parent or child? Justify your answer.
- b) What are the differences between RPC and RMI? Are there any issues with RPC that must be handled for ensuring proper communication? If yes, describe them briefly.
- c) What are CPU bound and I/O bound processes? Why is a good mix of these two types of process necessary? What type of scheduler ensures a good mix of processes? Explain its working mechanism with diagram.

4 + 3
(CO1, CO3, CO4)
(PO1, PO2, PO4)

3 + 5
(CO1, CO2, CO3)
(PO1, PO4, PO10, PO12)

2 + 2 + 6
(CO1, CO2, CO3)
(PO1, PO4, PO10, PO12)