B.Sc. Engg. / HD CSE 5th Semester | 24 February 2020 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION | **WINTER SEMESTER, 2019-2020**

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 **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

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1. a) What are the advantages of using Operating Systems (OS) over one single monolithic program? 5
   b) Write short note on Time Shared Operating System. State the difference between Soft and Hard Real time systems 3+4
   c) "The operating system should include applications such as web browsers and email program" - Is the statement true? Justify your answer. 5
   d) Give two reasons why caches are useful. What problems do they solve? What problems do they cause? If a cache can be made as large as the device for which it is caching (for instance, a cache as large as a disk), why not make it that large and eliminate the devices? 8

2. a) What is a system call? Mention three process-related and three file-related system calls with unix examples. 1+6
   b) It is sometimes difficult to achieve a layered approach if two components of the operating system are dependent on each other. Identify a scenario in which it is unclear how to layer two system components that require tight coupling of their functionalities. How these difficulties can be mitigated? 4+4
   c) What is the purpose of the command interpreter (shell)? Why is it usually separate from the kernel? 1+2
   d) What is the main advantage of the microkernel approach to system design? How do user programs and system services interact in a microkernel architecture? What are the disadvantages of the microkernel approach? 2+3+2

3. a) What is context-switching? Where and when is context switching done inside OS? Describe the actions taken by kernel to context switch between processes. 1+3+3
   b) Differentiate between process and thread with suitable examples. What are the benefits of Multithreaded Process? 4+4
   c) What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other? 5
   d) Can a multithreaded solution using multiple user-level threads achieve better performance on a multiprocessor system than on a single-processor system? Explain. 5

4. a) Describe the differences among short-term, medium-term, and long-term scheduling. 6
   b) Write short notes on the following.
      i. Shared Memory 4
      ii. Message Passing 4
   c) Write a short note on process state with state diagram. 5

d) What will be the output of the following Program? You must maintain the execution order of parent and child processes. 6

```
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
#include<unistd.h>
#include<sys/types.h>

int globalVariable = 2;

int main()
{
        char sIdentifier[20];
        int iStackVariable = 80, i;

        pid_t pid = fork();
        if (pid == 0)
        {
                strcpy(sIdentifier, "Child Process: ");
                for(i=0; i<100; i++)
                {
                        globalVariable++;
                }
                for(i=10; i>0; i--)
                {
                        iStackVariable--;
                }
        }
        else if(pid<0)
        {
                printf("Failed to fork\n");
        }
        else
        {
                strcpy(sIdentifier, "Parent Process: ");
                wait(NULL);
        }

       printf("%s Stack variable: %d\n", sIdentifier, iStackVariable);
       printf("%s Global variable: %d\n", sIdentifier, globalVariable);

        return 0;
}
```