Kingdom of Saudi Arabia Ministry of Education University of Jeddah College of Computer Science and Engineering Department of Computer Science and Artificial Intelligence		المملكة العربية السعودية وزارة التعليم جامعة جدّة كلية علوم وهندسة الحاسب قسم علوم الحاسب والذكاء الاصطناعي

Assignment 1

CCCS 225 Operating Systems

Second Trimester 2022/2023

Submission Date/Time: 14 Jan 2023 before 23:59

(At least one week should be given to students, after uploading for them)

Student Name: Khalid Nimri **Student ID:** [redacted]

Instructor Name	Section
[redacted]	[redacted]

Instructions:

The assignment must be submitted before the allocated Date/Time.

The assignment must by uploaded on LMS (or sent by email to teacher@uj.edu.sa).

Plagiarism will be punished according to university rules.

PLO/CLO	SO
PLO K1 (CLO 1): Illustrate the basic roles, functions and services of operating systems and explain main cybersecurity issues related to operating systems	**SO 1:** Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions

		Max Score	Student Score
PLO K1 / CLO 1 / SO 1	**Question 1**	**4**	
PLO K1 / CLO 1 / SO 1	**Question 2**	**6**	
Total		**10**	
Teacher Comments (if any):			

Question 1: Introduction and Operating System Structures [PLO K1 / CLO 1 / SO 1] [4 marks]

A. Write at least 5 definitions of Operating Systems. [1 mark]

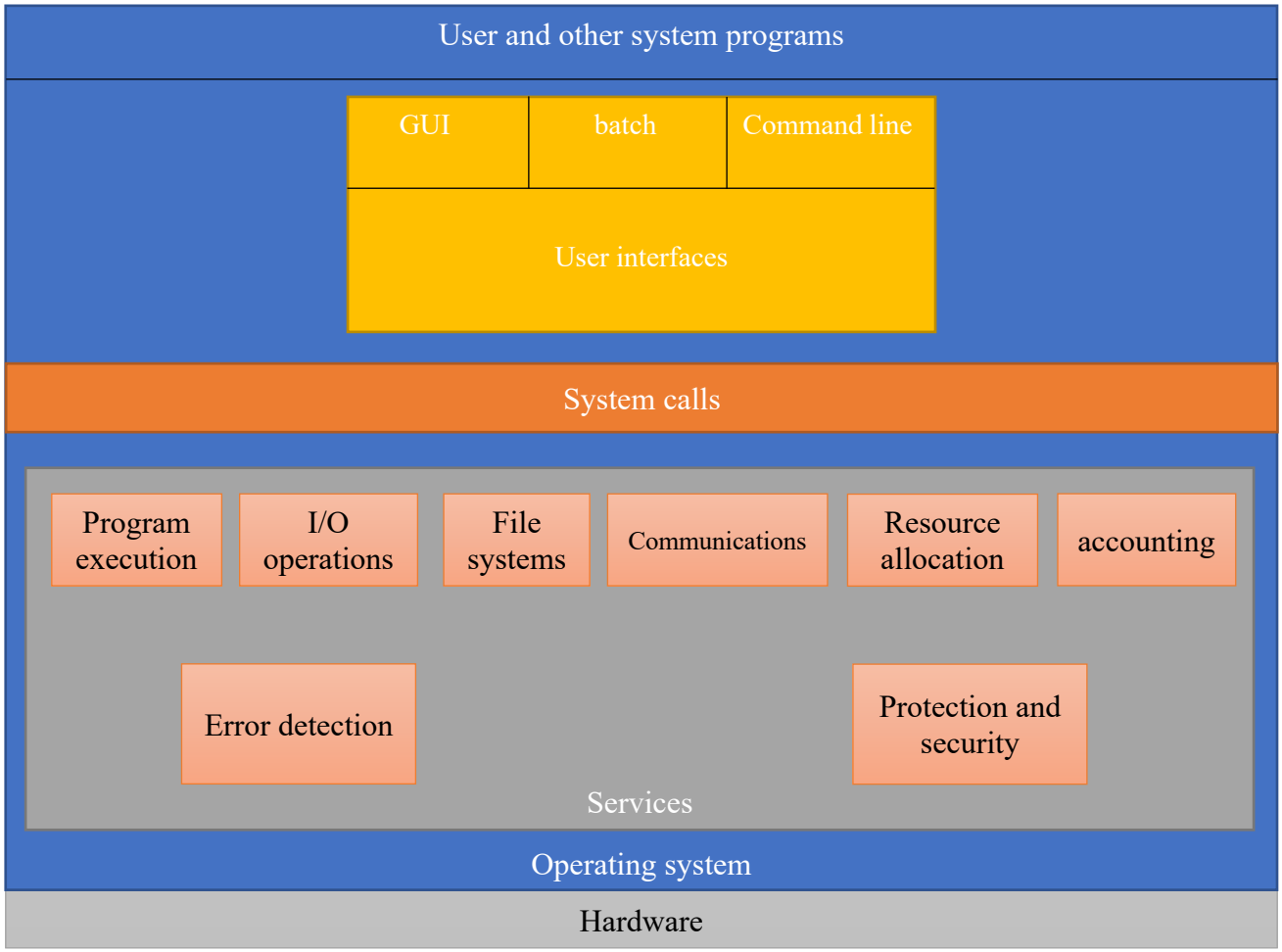
1. **The application programs require certain common operations such as those controlling the I/O, printing, taking something form hard disc, showing something in monitor etc. These common operations are then brought together into one piece of s/w: the Operating System**
2. **It's a software (collection of programs) that acts as an intermediary between computer hardware and the user (or various application programs used by the user).**
3. **It is a system software ,it is initially loaded into computer by a boot program ,manages the resources of the computer and also provide a common ground for the user related program.**
4. **Operating System provides an environment to other program and control the running of user program.A user cannot run an application program on the computer without an Operating System.**
5. **Operating Systems performs functions like: ≥ Process Management (CPU Scheduling, Process Synchronization) >**
6. **Main Memory Management * IO management (File & Disc Management) ≥ Protection & Security**

B. Write names and the main concepts of at least 5 storage types in a computer (1 comprehensive sentence for each). [1 mark]

1. **RAM - Random Access Memory .It is a primary storage device. Computer bring task from secondary storage to primary storage as it has more speed than its former.**
2. **CLOUD STORAGE - Users can store their data on data centers over the internet where they can save their databases and files. The data can be easily accessed over the internet anytime and anywhere.**
3. **FLASH MEMORY DRIVE - Eg. Pen drives, Memory Card: Easy to use, Portable, easily available and cheaper to use.**
4. **OPTICAL STORAGE DEVICE: Uses the concepts of laser or light to detect or to store data. Cheaper then the previous. Eg. CD-ROM, Blu-Ray**
5. **MAGNETIC STORAGE DEVICE: A magnetic filed is created when these types of device are inserted into computer. Using the magnetic field storage as well as reading of data is done. example - Floppy Disc , Hard Drives**

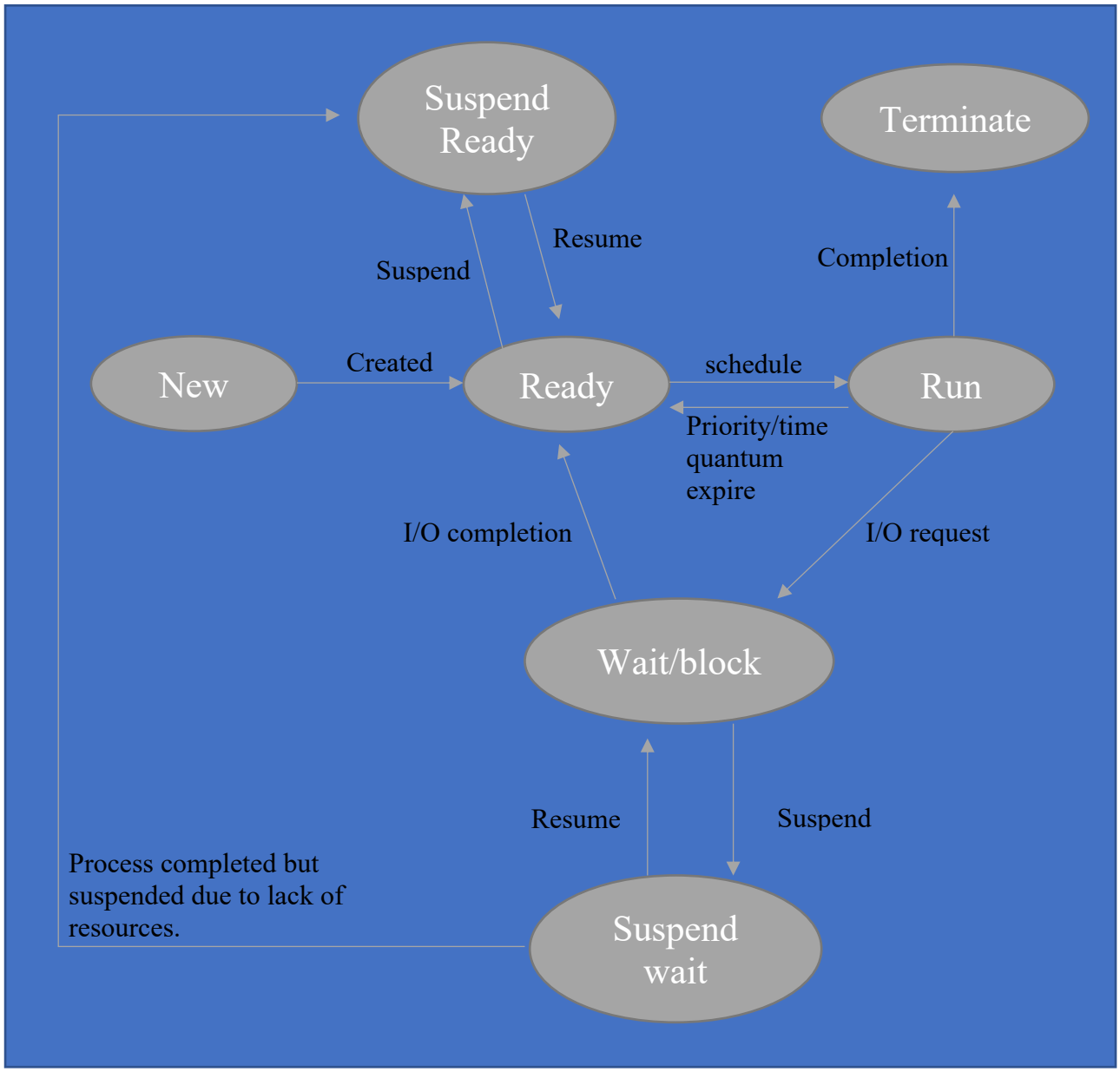
C. Draw an architectural diagram to show various operating system services and their placement with the other entities of system, e.g., user, interfaces, system calls and hardware etc.
Do not copy/paste any diagram from slides, book or web, it will graded with zero marks; only draw

original diagram by yourself (diagram must be editable for the teacher). [2 marks]



Question 2: Process and Threads [PLO K1 / CLO 1 / SO 1] **[6 marks]**

A. Draw a symbolic diagram that shows different states and transitions of a process. The shapes used for all states and transitions must be labelled.
Do not copy/paste any diagram from slides, book or web, it will graded with zero marks; only draw original diagram by yourself (diagram must be editable for the teacher). [3 marks]



B. Define and explain Thread? [1 mark]

A thread is a single sequential flow of execution of tasks of a process, so it is also known as thread of execution or thread of control. There is a way of thread execution inside the process of any operating system. Apart from this, there can be more than one thread inside a process. Each thread of the same process makes use of a separate program counter and a stack of activation records and control blocks. Thread is often referred to as a lightweight process.

C. Write at least 4 benefits of multithreading with explanation? [2 marks]

1. **Responsiveness** -Multithreading in an interactive application may allow a program to continue running even if a part of it is blocked or is performing a lengthy operation, thereby increasing responsiveness to the user.

   In a non-multi-threaded environment, a server listens to the port for some request and when the request comes, it processes the request and then resume listening to another request. The time taken while processing of request makes other users wait unnecessarily. Instead, a better approach would be to pass the request to a worker thread and continue listening to port.For example, a multi-threaded web browser allows user interaction in one thread while a video is being loaded in another thread. So instead of waiting for the whole webpage to load the user can continue viewing some portion of the webpage.

2. **Resource Sharing** -Processes may share resources only through techniques such as-
   ->Message Passing -> Shared Memory

   Such techniques must be explicitly organized by programmer. However, threads share the memory and the resources of the process to which they belong by default.The benefit of sharing code and data is that it allows an application to have several threads of activity within same address space.

3. **Economy**- Allocating memory and resources for process creation is a costly job in terms of time and space.

   Since, threads share memory with the process it belongs, it is more economical to create and context switch threads. Generally, much more time is consumed in creating and managing processes than in threads.In Solaris, for example, creating process is 30 times slower than creating threads and context switching is 5 times slower.

4. **Scalability**- The benefits of multi-programming greatly increase in case of multiprocessor architecture, where threads may be running parallel on multiple processors. If there is only one thread, then it is not possible to divide the processes into smaller tasks that different processors can perform.Single threaded process can run only on one processor regardless of how many processors are available.Multi-threading on a multiple CPU machine increases parallelism.