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## Homework - Operating System Security

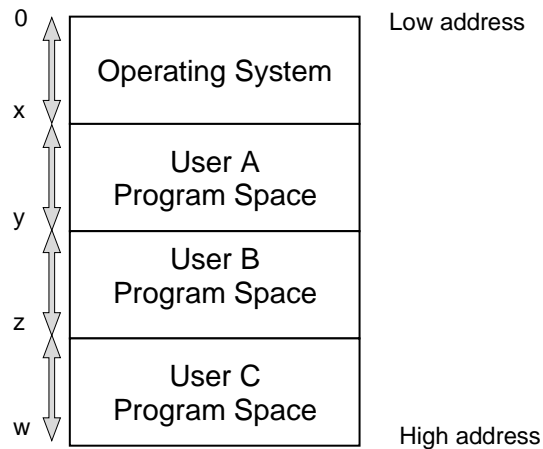
Total = 60 points

### Instructions:

- 1) Each new question should start from a new page. Pls copy-paste the question before your response.
- 2) Although you can work in a group, the final submission is an individual assignment.
- 3) Simple and clear arguments or comments in Bullet points about the solution Well-labeled block diagram as and when required
- 4) Keywords are highlighted/underlined
- 5) Please, submit a typed response. Handwritten response is unacceptable.

Pls follow above policies, otherwise you will lose 10% for each violation.

1. **(10 points)** What are the contents of the Base and Bounds register for User A, B and C?



Complete the following table with appropriate address values based on the diagram shown above **(9 points)**:

Users	Base Register	Bounds Register
User A	$X + 1$	y
User B	$Y + 1$	z
User C	$Z + 1$	w

What is the role of the Base and Bounds register in memory management in multiuser platform?  
Explain in few sentences. **(1 point)**

- They are used to delineate the start and end of allocated memory addresses for different users.

2. **(10+10 points)** A university project consists of the following five files:

File name	Functionality
description.pdf	contains information about project and team
help.txt	contains information about usage and command options
main.cpp	Main code as the name suggests. This calls all the functions defined in calculator.cpp
calculator.cpp	Code to be used by the generic user to add new functionality
calculator.h	

The users and their roles for accessing the files are listed below:

User category	Role description
Generic User	Edit all the cpp and header files only.
Developer	Edit all the cpp and header files. The developer can also update help.txt.
Super User	Edit all the project files
Technical Writer	Edit help.txt and description.pdf

All users have read access to all the files. None of the files are executable. Create the **Access Control List and Access Control Matrix** for the above example.

#### Access Control Matrix

	description.pdf	help.txt	main.cpp	calculator.cpp	calculator.h
Generic User			R, w	R, w	R, w
Developer		R, w	R, w	R, w	R, w
Super User	R, w	R, w	R, w	R, w	R, w
Technical Writer	R, w	R, w			

3. **(10 points)** What are the basic features of a secured multiprogramming OS? Provide at least 5 features. Explain this with an example of “Company AutoTech Inc” consisting of three teams IT, Testing and HR.
- 5 features would be authentication of users, protection of memory, enforcement of sharing, allocation and access control to general objects, and guarantee of fair service. Authentication of users would give users their respective permissions, and it would keep, for example, HR from changing some .ini files that IT has control of. Protection of memory would save the OS from overwriting or mixing file data if IT and Testing were to save a file at the same time. Enforcement of sharing is. Allocation and access control to general objects would save the OS’s base objects from being misallocated or altered by parties that have no business doing so. Guarantee of fair service will ensure that all users have appropriate resources.

4. **(5 points)** Give an example of the use of **physical separation** for security in a computing environment.
- Physical separation is using different physical device. For example, syncing your computer with a printer over ethernet or wifi. Or even connecting your computer to another device and sharing files.

5. **(5 points)** Give an example of the use of **temporal separation** for security in a computing environment.
- Temporal separation is executing tasks on the same hardware but doing it at different times. For example, saving two documents at the same time, the OS will save document1 before starting to save document2.

6. **(10 points)** For the following memory layout and Page Translation Table, show the conversion for each page to a page frame address

Logical Program

Page 0
Page 1
Page 2
Page 3
Page 4
Page 5
Page 6
Page 7

Page Translation Table  
Page Address

0	i
1	b
2	f
3	a
4	k
5	c
6	m
7	h

A	Page 3
B	Page 1
C	Page 5
D	
E	
F	Page 2
G	
H	Page 7
I	Page 0
J	
K	Page 4
L	
M	Page 6