<u>Operating System Assignment:</u>

1. Explain how using a unprotected system call solution can give the process programmer unauthorized read and write access to another process memory. You can assume a malicious attacker with full knowledge of your implementation and the memory addresses to reach. Explain step by step how to first read a memory portion and then overwrite selected parts.

2. What is a buffer overflow?

3. What is an address space?

4. Given a 15-bit address space and assuming 2-bytes is used for each page pointer: a) Determine a minimum page size so that a page table fit completely in one page and cover the entire address space. b) How many pages does it yield?

5. Given a modern 64-bit architecture with 6-bytes used for each page pointer, 1 MB 6. pages, and 16 GB installed memory: a) How much memory can be addressed by the paging solution? b) How large must each page table be? c) Suggest and motivate a better solution.

6. A system contains three programs and each requires three tape units for its operation. The minimum number of tape units which the system must have such that deadlocks never arise. Justify your answer.

7. The following program consists of 3 concurrent processes and 3 binary semaphores. The semaphores are initialized as S0=1, S1=0, S2=0.

Process P0	**Process P1**	**Process P2**

while (true) {
wait (S0);
print (0);
release (S1);
release (S2);
}
	wait (S1);
	Release (S0);
		wait (S2);
		release (S0);

Atleast how many times will process P0 will print '0'? Justify your answer.

8. Define the properties of good Hash Function must have. Encrypt **"HELLO SIR"** using a transposition cipher with the following key:

Plain Text :   2 4 1 3
Cipher Text :   1 2 3 4

9. Show how Digital signature provides message integrity, authentication and nonrepudiation.

10. A process executes the following code

```
for (i = 0; i < n; i + +)    fork ( );
```

How many number of **child** processes created in the above code? Justify your answer.