

Name _____

All questions are worth 10 points. Maximum score: 60

1. Suppose you are using a shared variable named **S**, and that **S** currently has the value 12. You are running two independent processes, **P₁** and **P₂**, which contain the following two unprotected statements. If **S** has the initial value of 35, what are the possible values of **S** after both statements execute, and how can these values occur?

 $S = S+20;$ $S = S+9;$

2. You are given the following two programs. These programs have a shared message queue, which requires mutual exclusion while it is being accessed, and a shared Count variable that is being used to determine whether the message queue is empty or full. Use semaphores to fix these programs so they will work.

```
while (!eof(MyFile))
{
    while (Count == Max);
    Push(Message);
    Count++;
}
Push(EofMessage);
```

```
while(true)
{
    while (Count == 0);
    Pop(&Message);
    Count--;
    if (Message == EOFMessage)
        break;
}
```

3. For deadlock prevention, we must guarantee that certain conditions cannot occur. There are five of these conditions. List them and give a one or two-line explanation of each.

4. Given the following allocation tables, is the system in a safe state? If we grant a request of (0,0,2) from P0, will the system be in a safe state? If the states are safe, show the safe sequence. Otherwise show where building the safe sequence fails.

	Has		
	A	B	C
P0	1	0	0
P1	2	0	0
P2	0	1	1
P3	1	0	2
P4	2	2	1

	Max		
	A	B	C
	3	5	7
	4	2	7
	2	1	1
	1	5	5
	2	3	2

Free		
A	B	C
0	2	3

5. Is the following system deadlocked? If not show the “safe sequence” otherwise, list the processes that are deadlocked.

	Has		
	A	B	C
P0	1	1	2
P1	3	1	1
P2	0	1	1
P3	1	0	0
P4	2	2	2

	Req		
	A	B	C
P0	0	0	0
P1	1	3	2
P2	0	0	0
P3	2	1	0
P4	2	0	1

Free		
A	B	C
0	0	0

6. We have created a decimal machine with four-digit addresses. The first two digits are the page number, while the second two are the offset. Translate the following addresses, using the given table. If a particular virtual address cannot be translated, write “page fault” for the virtual address.

Page Table

32xx
14xx
21xx
60xx
77xx
14xx
20xx
52xx
03xx
01xx
47xx

Virtual	Real
0691	
0331	
0808	
1221	
0022	
0364	
0799	
0560	
1014	
0160	