Sample Question

1. Consider three processes, P, Q and R with the following code:
   - P: ps1; ps2; ps3; ps4;
   - Q: qs1; qs2; qs3; qs4;
   - R: rs1; rs2; rs3; rs4;

These processes have the following synchronization constraint:

a) rs1 must be the first statement to execute
b) process R should be the last process to exit
c) ps3 must execute after qs2
d) qs3 must execute after ps4 and rs3
e) rs4 must execute after either ps4 or qs4 (or both) have executed

Using Semaphores, provide initial values and updated codes for P, Q and R that satisfy these constraints.

Sample Question

1. Solution:

s1 = 0
s2 = 0
s3 = -1
s4 = 0
s5 = -1

Process P	Process Q	Process R
<ps1>	<qs1>	<rs1>
<ps2>	<qs2>	<rs2>
<ps3>	<qs3>	<rs3>
<ps4>	<qs4>	<rs4>

Sample Question

1. Solution:

s1 = 0
s2 = 0
s3 = -1
s4 = 0
s5 = -1

Process P	Process Q	Process R
wait(&s1)	wait(&s1)	
<ps1>	<qs1>	<rs1>
		signal(&s1)
		signal(&s1)
<ps2>	<qs2>	<rs2>
<ps3>	<qs3>	<rs3>
<ps4>	<qs4>	<rs4>

Sample Question

1. Solution:

s1 = 0
s2 = 0
s3 = -1
s4 = 0
s5 = -1

Process P	Process Q	Process R
wait(&s1)	wait(&s1)	
<ps1>	<qs1>	<rs1>
		signal(&s1)
		signal(&s1)
<ps2>	<qs2>	<rs2>
wait(&s2)	signal(&s2)	
<ps3>	<qs3>	<rs3>
<ps4>	<qs4>	<rs4>

Sample Question

1. Solution:

s1 = 0
s2 = 0
s3 = -1
s4 = 0
s5 = -1

Process P	Process Q	Process R
wait(&s1)	wait(&s1)	
<ps1>	<qs1>	<rs1>
		signal(&s1)
		signal(&s1)
<ps2>	<qs2>	<rs2>
wait(&s2)	signal(&s2)	
	wait(&s3)	
<ps3>	<qs3>	<rs3>
		signal(&s3)
<ps4>	<qs4>	<rs4>
signal(&s3)		

Sample Question

1. Solution:

s1 = 0
s2 = 0
s3 = -1
s4 = 0
s5 = -1

Process P	Process Q	Process R
wait(&s1)	wait(&s1)	
<ps1>	<qs1>	<rs1>
		signal(&s1)
		signal(&s1)
<ps2>	<qs2>	<rs2>
wait(&s2)	signal(&s2)	
	wait(&s3)	
<ps3>	<qs3>	<rs3>
		signal(&s3)
		wait(&s4)
<ps4>	<qs4>	<rs4>
signal(&s3)	signal(&s4)	
signal(&s4)		

Sample Question

1. Solution:

s1 = 0
s2 = 0
s3 = -1
s4 = 0
s5 = -1

Process P	Process Q	Process R
wait(&s1)	wait(&s1)	
<ps1>	<qs1>	<rs1>
		signal(&s1)
		signal(&s1)
<ps2>	<qs2>	<rs2>
wait(&s2)	signal(&s2)	
	wait(&s3)	
<ps3>	<qs3>	<rs3>
		signal(&s3)
		wait(&s4)
<ps4>	<qs4>	<rs4>
signal(&s3)	signal(&s4)	wait(&s5)
signal(&s4)	signal(&s5)	
signal(&s5)		