

# Real Time College

מרכז להכשרות מקצועיות והשמה בתעשיית ההייטק

Q5-

You have a system that consists of 3 tasks: Task1, Task2, Task3. Task1 is the first running task and its priority is 50.

T1 ()

{

L1: SemBCreate (&SemA, 0, POLICY\_FIFO)

L2: XXXXXXXX SemBCreate (&SemB, 0, POLICY\_FIFO)

L3: TaskCreate (&T2, 100);

L4: TaskCreate (&T3, 150);

L5: XXXXXXXX SemBTake (&SemA, INFINITE\_TIMEOUT, BLOCK\_IF\_FAIL)

L6: XXXXXXXX SemBTake (&SemB, INFINITE\_TIMEOUT, BLOCK\_IF\_FAIL)

L7: Hold\_CPU\_For (10)

}

T2 ()

{

L1: Hold\_CPU\_For (20)

L2: XXXXXXXX SemBGive (&A)

}

T3 ()

{

L1: XXXXXXXX SemBGive (&B)

L2: Hold\_CPU\_For (30)

}

Our objective is to let T1 reach L7 only after T2 has completed and before T3 reaches L2.

You must not use any delays or change priorities. Use only semaphores – choose the right ones.

5.1 Please replace each instance of XXXXXXXX by a valid code.

5.2 Please provide a time-table:

Task	Time	Prio	Sem	state
T1	5	50	swq(A) = 1	BOS
T2	21	100	swq(A) = 0	Preempted+compl
T1	1	50	swq(B) = 1	BOS
T3	1	150	swq(B) = 0	Preempted
T1	10	50		Compl
T3	30	200		Compl
IDLE	FOREVER	Lowest-Priority		

Please notice – T2 is not really completed upon SemBGive, but since I didn't add any pseudo code after it – I'll accept the answer as shown here.

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Q6-

You have a system that consists of 2 tasks: Task1, Task2. Task1 is the first running task and its priority is 50.

The program crashed. What was the problem and how should you prevent it using Binary Semaphore.

char \*ptr;

T1 ()

```
{  
    SemBCreate (&SemA, 0, POLICY_FIFO);  
  
    ptr = malloc (100); /* Assume success */  
    TaskCreate (&T2, 100);  
    SemBTake (&SemA,, INFINITE_TIMEOUT, BLOCK_IF_FAILE)  
    free (ptr);  
}
```

T2 ()

```
{  
    *ptr = 0x10;  
    SemBGive (&SemA);  
}
```

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Q8-

You have a system that consists of 4 tasks: Task1, Task2, Task3, Task4. Task1 is the first running task and its priority is 50.

```
T1 ()
{
  SemBCreate (&SemA, 0, POLICY_FIFO)
  TaskCreate (&T2, 100);
  TaskCreate (&T3, 150);
  TaskCreate (&T4, 200);
  Hold_CPU_For (1)
}
T2 ()
{
  Hold_CPU_For (1)
  Block (10);
  SemBTake (&SemA, INFINITE_TIMEOUT, BLOCK_IF_FAILE)
  Hold_CPU_For (5)
}
T3 ()
{
  Hold_CPU_For (1)
  SemBTake (&SemA, INFINITE_TIMEOUT, BLOCK_IF_FAILE)
  Hold_CPU_For (5)
}
T4 ()
{
  Hold_CPU_For (30)
  SemBGive (&SemA)
  Hold_CPU_For (5)
}
```

8.1 Please provide a time-table.

8.2 Replace POLICY\_FIFO by POLICY\_PRIORITY. Provide the new time table.

A8.1

Task	Time	Sem	state
T1	5		compl
T2	1		IO(10)
T3	2	swq = 1	BOS
T4	8	swq = 1	Preempted
T2	1	swq = 2	BOS
T4	23	swq = 1	Preempted
T3	5		Compl
T4	5		Compl
IDLE			

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A8.2

Task	Time	Sem	state
-----			
T1	5		compl
T2	1		IO(10)
T3	2	swq = 1	BOS
T4	8	swq = 1	Preempted
T2	1	swq = 2	BOS
T4	23	swq = 1	Preempted
T2	5		Compl
T4	5		Compl
IDLE			

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Q9-

You have one global variables var1. There are 60 tasks in the system. Each one of them may call the functions zoo or zoo1. The total concurrent calls to the functions zoo and zoo1 (by concurrent tasks) should not exceed 8. The functions zoo and zoo1 call the functions foo and foo1 respectively. The functions foo() and foo1() can't access Var1 concurrently . The function main (), which was created before – initializes global variables including semaphores. Please add code to the functions main, foo, foo1, zoo and zoo1.

These are the functions:

```
Main ()
{
XXXXXXX SemCCreate (&SemA, 8, 8, POLICY_FIFO);
XXXXXXX SemMCreate (&SemB, POLICY_FIFO);
}
zoo ()
{
XXXXXXX SemCTake (&SemA, INFINITE_TIMEOUT, BLOCK_IF_FAILE);
printk ("Hello from zoo\n");
}
foo ()
XXXXXXX SemCGive (&SemA);
}
zoo1 ()
{
XXXXXXX SemCTake (&SemA, INFINITE_TIMEOUT, BLOCK_IF_FAILE);
printk ("Hello from zoo1\n");
}
foo1 ()
XXXXXXX SemCGive (&SemA);
}
foo ()
{
XXXXXXX SemMTake (&SemB, INFINITE_TIMEOUT, BLOCK_IF_FAILE);
Var1 += 2;
XXXXXXX SemMGive (&SemB);
}
foo1 ()
{
int a;
XXXXXXX SemMTake (&SemB, INFINITE_TIMEOUT, BLOCK_IF_FAILE);
a = Var1;
XXXXXXX SemMGive (&SemB);
printk ("a was read with appropriate value\n");
}
```

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**\*Q\***- Admision question

There are two tasks T1 and T2 in the system.

The two semaphores that you'll be required to use have already been initialized as follow:

SemBCreate (&SemA, 0, POLICY\_FIFO)

SemBCreate (&SemB, 0, POLICY\_FIFO)

The following global variables are initialized, too:

Flag = 0;

Global = 0;

The priorities of the tasks are not important.

We want to synchronize T1 and T2 in a way that if T1 and T2 completed N loops each (2\*N total) - the variable Global should have been incremented only N times.

You must not use any delays or change priorities. Use only semaphores – choose the right ones.

Please replace each instance of XXXXXXXX by a valid code.

T1 ()

```
{
while (1)
{
Hold_CPU_For (Unknown Time)
Block (Unknown Time)
Hold_CPU_For (Unknown Time)
Flag |= 0x1 /* Set bit 0 to 1 */
If (Flag == 0x3)
{
Flag = 0;
XXXXXXXX SemBGive (&SemB);
}
else
{
XXXXXXXX SemBTake (&SemA, INFINITE_TIMEOUT, BLOCK_IF_FAILE);
Global ++;
}
}
}
```

T2 ()

```
{
while (1)
{
Hold_CPU_For (Unknown Time)
Block (Unknown Time)
Hold_CPU_For (Unknown Time)
Flag |= 0x2 /* Set bit 1 to 1 */
If (Flag == 0x3)
{
Flag = 0;
SemBGive (&A)
}
}
```

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```
else
{
XXXXXXXX SemBTake (&SemB, INFINITE_TIMEOUT, BLOCK_IF_FAILE);
Global ++;
}
}
}
```



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