B033040009 資工系 二年級 蔡宜勳

1. (10%) Consider a computer that does not have a TEST AND SET LOCK instruction but does have an instruction to swap the contents of a register and a memory word in a single indivisible action. Can that be used to write a routine enter region such as the one found in Fig. 2–12.

Ans.
Yes. When the register's contents get swapped with the memory word, even if it is called by multiple processes nearly simultaneously, whatever value used to be in the register will be swapped into the memory word. The value that was originally in the register can't be lost, since the swapping is done in a "single indivisible action" and can't be interrupted.

2. (20%) Measurements of a certain system have shown that the average process runs for a time T before blocking on I/O. A process switch requires a time S, which is effectively wasted (overhead). For round-robin scheduling with quantum Q, give a formula for the CPU efficiency (i.e., the useful CPU time divided by the total CPU time) for each of the following:
     (a) $Q = \infty$
     (b) $Q > T$
     (c) $S < Q < T$
     (d) $Q = S$
     (e) Q nearly 0
Ans.
(a) $T/(T+S)$
(b) $T/(T+S)$
(c) $Q/(Q+S)$
(d) $Q/(Q+Q) = 50\%$
(e) 0

3. (10%) Consider the interprocess-communication scheme where mailboxes are used. Suppose a process P wants to wait for two messages, one from mailbox A and one from mailbox B. What sequence of send and receive should it execute so that the messages can be received in any order?

Ans.
receive(A, &messageA)
receive(B, &messageB)

or

receive(B, &messageB)
receive(A, &messageA)

4. (10%) Consider the following program that uses the Pthreads API. What would be the output of the program? (Note that the line numbers are for references only.)

Ans.
A = 1
B = 1
C = 2
D = 2