(1) What are the two inefficiency problems in “processes”?

- High overhead in inter-process-communication (IPC) or sharing data
- High overhead in performing context-switching

(2) How do threads reduce the high context switching overhead in processes?

Threads reduce the overhead in performing context switching by not “switching” the entire PCBs. Threads perform context switching by switching only TCBs, which are smaller than PCBs. Switching smaller amount of data reduces the time needed for each context switching.

(3) Show the typical internal structure of a process that consists of multiple threads.

**Grading policy:** -2 points for each incorrect/missing item in the figure above (except for “OS”)

(4) What information do multiple threads in a process can share?

   Global variables

(5) Which of the following items in the PCB for a process should belong to the global PCB or TCB (private PCB)?

   (a) Processor registers (TCB)
   (b) Program Counter (PC) register (TCB)
   (c) User ID (PCB)
   (d) Process ID (PCB)
   (e) The list of opened files (PCB)
   (f) The list of the assigned I/O devices (PCB)
   (g) Stack Pointer (SP) register (TCB)

   Grading policy: -2 point for each incorrect response