

- 1.30 Suppose a particular TV set-top box at a hotel supports encrypted video, and that decrypting each video frame consists of three sub-tasks A, B and C. The execution times of each task on a microprocessor versus a custom digital circuit are 100 ms versus 1 ms for A, 10 ms versus 2 ms for B, and 15 ms versus 1 ms for C. Partition the tasks among a microprocessor and custom digital circuitry, such that you minimize the amount of custom digital circuitry, while meeting the constraint of decrypting at least 30 frames per second.

A microprocessor-only implementation requires 100ms for A, 10ms for B, and 15ms for C - 125ms total or 8 frames per second (fps). Changing sub-task A to a custom digital circuit reduces the per-frame execution time to $1\text{ms}+10\text{ms}+15\text{ms} = 26\text{ms}$, which permits in excess of 30fps to be decrypted.