操作系统 作业 11

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5. Each bus transaction has a request and a response each taking 40 nsec, or 80 nsec per bus transaction; 32 b/ 80 ns = 0.4Gbps.

6. (a) In word-at-a-time mode, acquiring the bus / setting up the disk controller and transferring the word each takes $1000(t_1 + t_2)$ nsec, and acknowledging takes $t_1 + t_2$ nsec, yielding a total of $2001(t_1 + t_2) \approx 2001t_1$ nsec ($t_1 \gg t_2$).

(b) In burst mode, it takes $t_1 + t_2$ nsec to acquire the bus and set up the disk controller, t_1 nsec for the disk controller to acquire the bus, $1000t_2$ nsec for the burst transfer, and $t_1 + t_2$ nsec for acquiring the bus for acknowledging. The total is $3t_1 + 1002t_2$.

8. Entering and returning from an interrupt requires pushing and popping 34 words onto and from the stack, costing $34 \times 2 \times 5 = 340$ nsec. Assuming no extra work during the interrupt, the maximum number of interrupts per second cannot be more than $1/(340 \times 10^{-9}) \approx 2.94 \times 10^6$.

12. The printer prints at $50 \times 80 \times 6 = 24,000$cpm= 400cps. Each character uses 50 sec of CPU time for the interrupt, so for each second the interrupt overhead is 20 msec. Since the I/O interrupt costs only 2% of the CPU, running this printer is a sensible thing to do.

14. (a) Device driver. (b) Device driver. (c) Device-independent software (OS). (d) User software.