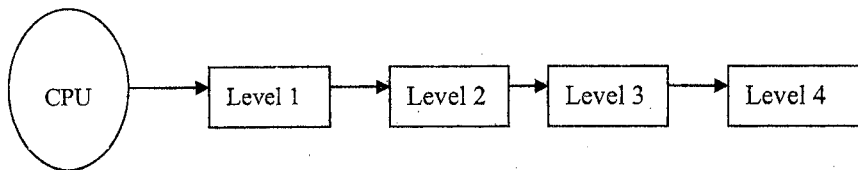


所別：通訊工程學系碩士班 乙組(一般生) 科目：計算機系統

(一) 計算機組織

- (15%) Assume that a computer system includes a cache unit which employs the first in first out (FIFO) replacement policy. If it was found that the resulting hit rate is very low. Please indicate whether each of the following enhancements results in negative effect (NG), no effect (N), small positive effect (S), or large positive effect (L) on the increasing hit ratio and please also give a short and brief explanation.
 - To increase the size of cache
 - To increase the size of main memory
 - To use victim cache
 - To increase the number of blocks
 - To employ the least recently used (LRU) instead of FIFO
- Consider the following 4-level memory hierarchy. The access times for each level (from level 1 to level 4) are $a_1, a_2, a_3,$ and $a_4,$ respectively. Assume that the hit ratios of each level are $h_1, h_2, h_3,$ and $h_4,$ respectively.



- (5%) Let the T be the average memory access time, please write T in terms of $a_1, a_2, a_3, a_4, h_1, h_2, h_3,$ and $h_4.$
 - (8%) If the access times of all levels are the same and the hit ratio is 0.8 for all levels in the original design. Please compare the improvement of T for the following cases:
 - To increase the hit ratio of level 1 from 0.8 to 0.9
 - To increase the hit ratio of level 4 from 0.8 to 0.9
- (8%) Consider a 5-stage pipeline, if it needs two clock cycles in stage 3, while each of the other stages only needs one clock cycle. Please depict the execution flow of 5 instructions. And how many clock cycles are required to execute n instructions?

(後面還有試題)

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4. Three schemes with the following speedups are proposed for a new architecture:
- Speedup of scheme 1: 30
 - Speedup of scheme 2: 20
 - Speedup of scheme 3: 10
- (1) (6%) If only one enhancement is usable at a time. And if scheme 1 and 2 are each usable for 25% of the time, what fraction of the time must scheme 3 be used to achieve an overall speedup of 10?
- (2) (8%) Assume, for some benchmark, the fraction of use is 20% for each of scheme 1 and 2 and 60% for scheme 3. If we want to maximize performance, and two schemes can be implemented, which shall be chosen? And what is the speedup?

(二) 網路基本原理

5. (10%) Explain the following terminologies and describe the functions they provide.
- (1) Dynamic Domain Name Server (DDNS)
 - (2) Intrusion Detection System (IDS)
6. (10%) Use example(s) to illustrate the differences among “queuing delay”, “transmission delay”, and “propagation delay” defined in computer networks.
7. (20%) To provide pipeline-based reliable transmissions over unreliable transmission channel (with error and loss), end systems are requested to support the following capabilities: (1) Checksum (2) Timer (3) Sequence Number (4) Acknowledgement (in cumulative or individual manner) (5) Sliding Window.
- (1) Explain the function of each capability. (10%)
 - (2) Explain the relationships among them and how they work. (10%)
8. (10%) Mobile IP is designed to support mobile users in Internet.
- (1) What is the situation the Mobile IP is necessary for mobile users?
 - (2) What are the differences between Mobile IPv4 and Mobile IPv6?