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Lab 5

COMPUTER TECHNOLOGY 4-2

(E1) (a) Miss Analysis:

$$X: 1000 \times 4 = 4000$$

$$= 4000/32 \text{ bytes}$$

$$= 125 \text{ blocks}$$

$$Y: 1000 \times 4 = 4000$$

$$= 4000/32$$

$$= 125 \text{ blocks}$$

Compulsory misses $= 125 + 125$

$$= 250 \text{ misses}$$

Capacity Misses:

$$16 \times 32 = 512 \text{ blocks}$$

No capacity miss.

Conflict Misses:

$$= 0 \times 4000/32 = 0 \times 200$$

$$0 \times 8000/32 = 0 \times 400$$

Cache: 512 blocks

Mapping: 0×200 to 0 ($0 \times 200 \, ? \, 512 = 0$)

0×400 to 0 ($0 \times 400 \, ? \, 512 = 0$)

~~×~~ $= 1000/8$

$$= 125 \text{ conflict misses}$$

Total Misses:

$$= 250 + 125$$

$$= 375 \text{ misses}$$

(b) Software solution to reduce number of data cache misses:

~~XXXXXXXX~~ Solution:- Set-Associative Cache

- Cache Organization:-
  16 cache size
  32 bytes block size
  2-way set associativity
  Number of sets: 16 kb / (32 × 2)
  $$= 256 \text{ sets}$$

- Miss Analysis
  $$= 250$$

- Misses with 2-way set associativity:
  $$= 250$$

(c) Data cache miss rate:-

Memory access $= 1000 \times 2 + 1$
$$= 3000$$

Miss Rate (Direct mapped)
$$= 375/3000$$
$$= 0.125$$
$$= 12.5\%$$

Miss Rate (2-way set associative)
$$= 250/3000$$
$$= 0.0833$$
$$= 8.33\%$$