CS224

Section No: 6

Spring 2021

Lab No: 6

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**a.1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Block Size**  **(words)**  **Cache Size**  **(bytes)** | **8** | **16** | **32** | **64** | **128** |
| **256 (0.26 KB)** | Cache Miss Rate: 12%  Number Of Misses: 632 | Cache Miss Rate: 6%  Number Of Misses: 319 | Cache Miss Rate: 3%  Number Of Misses: 162 | Cache Miss Rate: 2%  Number Of Misses: 84 | Cache Miss Rate: -  Number Of Misses: - |
| **512 (0.5 KB)** | Cache Miss Rate: 12%  Number Of Misses: 632 | Cache Miss Rate: 6%  Number Of Misses: 319 | Cache Miss Rate: 3%  Number Of Misses: 162 | Cache Miss Rate: 2%  Number Of Misses: 84 | Cache Miss Rate: 1%  Number Of Misses: 44 |
| **1024 (1 KB)** | Cache Miss Rate: 12%  Number Of Misses: 632 | Cache Miss Rate: 6%  Number Of Misses: 319 | Cache Miss Rate: 3%  Number Of Misses: 162 | Cache Miss Rate: 2%  Number Of Misses: 84 | Cache Miss Rate: 1%  Number Of Misses: 44 |
| **2048 (2 KB)** | Cache Miss Rate: 12%  Number Of Misses: 632 | Cache Miss Rate: 6%  Number Of Misses: 319 | Cache Miss Rate: 3%  Number Of Misses: 162 | Cache Miss Rate: 2%  Number Of Misses: 84 | Cache Miss Rate: 1%  Number Of Misses: 44 |
| **4096 (4 KB)** | Cache Miss Rate: 12%  Number Of Misses: 632 | Cache Miss Rate: 6%  Number Of Misses: 319 | Cache Miss Rate: 3%  Number Of Misses: 162 | Cache Miss Rate: 2%  Number Of Misses: 84 | Cache Miss Rate: 1%  Number Of Misses: 44 |

**Table 1.1 Miss Rates of Row by Row Average for Direct Mapped Cache (N = 50)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Block Size**  **(words)**  **Cache Size**  **(bytes)** | **8** | **16** | **32** | **64** | **128** |
| **256 (0.26 KB)** | Cache Miss Rate: 55%  Number Of Misses: 2821 | Cache Miss Rate: 52%  Number Of Misses: 2663 | Cache Miss Rate: 51%  Number Of Misses: 2583 | Cache Miss Rate: 39%  Number Of Misses: 1998 | Cache Miss Rate: -  Number Of Misses: - |
| **512 (0.5 KB)** | Cache Miss Rate: 55%  Number Of Misses: 2821 | Cache Miss Rate: 52%  Number Of Misses: 2663 | Cache Miss Rate: 51%  Number Of Misses: 2583 | Cache Miss Rate: 39%  Number Of Misses: 1998 | Cache Miss Rate: 20%  Number Of Misses: 1024 |
| **1024 (1 KB)** | Cache Miss Rate: 36%  Number Of Misses: 1845 | Cache Miss Rate: 52%  Number Of Misses: 2663 | Cache Miss Rate: 51%  Number Of Misses: 2583 | Cache Miss Rate: 39%  Number Of Misses: 1998 | Cache Miss Rate: 20%  Number Of Misses: 1024 |
| **2048 (2 KB)** | Cache Miss Rate: 26%  Number Of Misses: 1326 | Cache Miss Rate: 35%  Number Of Misses: 1776 | Cache Miss Rate: 51%  Number Of Misses: 2583 | Cache Miss Rate: 39%  Number Of Misses: 1998 | Cache Miss Rate: 20%  Number Of Misses: 1024 |
| **4096 (4 KB)** | Cache Miss Rate: 25%  Number Of Misses: 1280 | Cache Miss Rate: 22%  Number Of Misses: 1113 | Cache Miss Rate: 34%  Number Of Misses: 1710 | Cache Miss Rate: 39%  Number Of Misses: 1998 | Cache Miss Rate: 20%  Number Of Misses: 1024 |

**Table 1.2 Miss Rates of Column by Column Average for Direct Mapped Cache (N = 50)**

Graph 1.1 The Graph Of Miss Rate vs Block Size (Row Wise) (N = 50)

Graph 1.2 The Graph Of Miss Rate vs Block Size (Column Wise) (N = 50)

**a.2)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Block Size**  **(words)**  **Cache Size**  **(bytes)** | **8** | **16** | **32** | **64** | **128** |
| **256 (0.26 KB)** | Cache Miss Rate: 12%  Number Of Misses: 2507 | Cache Miss Rate: 6%  Number Of Misses: 1256 | Cache Miss Rate: 3%  Number Of Misses: 630 | Cache Miss Rate: 2%  Number Of Misses: 318 | Cache Miss Rate: -  Number Of Misses: - |
| **512 (0.5 KB)** | Cache Miss Rate: 12%  Number Of Misses: 2507 | Cache Miss Rate: 6%  Number Of Misses: 1256 | Cache Miss Rate: 3%  Number Of Misses: 630 | Cache Miss Rate: 2%  Number Of Misses: 318 | Cache Miss Rate: 1%  Number Of Misses: 162 |
| **1024 (1 KB)** | Cache Miss Rate: 12%  Number Of Misses: 2507 | Cache Miss Rate: 6%  Number Of Misses: 1256 | Cache Miss Rate: 3%  Number Of Misses: 630 | Cache Miss Rate: 2%  Number Of Misses: 318 | Cache Miss Rate: 1%  Number Of Misses: 162 |
| **2048 (2 KB)** | Cache Miss Rate: 12%  Number Of Misses: 2507 | Cache Miss Rate: 6%  Number Of Misses: 1256 | Cache Miss Rate: 3%  Number Of Misses: 630 | Cache Miss Rate: 2%  Number Of Misses: 318 | Cache Miss Rate: 1%  Number Of Misses: 162 |
| **4096 (4 KB)** | Cache Miss Rate: 12%  Number Of Misses: 2507 | Cache Miss Rate: 6%  Number Of Misses: 1256 | Cache Miss Rate: 3%  Number Of Misses: 630 | Cache Miss Rate: 2%  Number Of Misses: 318 | Cache Miss Rate: 1%  Number Of Misses: 162 |

**Table 2.1 Miss Rates of Row by Row Average for Direct Mapped Cache (N = 100)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Block Size**  **(words)**  **Cache Size**  **(bytes)** | **8** | **16** | **32** | **64** | **128** |
| **256 (0.26 KB)** | Cache Miss Rate: 56%  Number Of Misses: 11258 | Cache Miss Rate: 53%  Number Of Misses: 10631 | Cache Miss Rate: 51%  Number Of Misses: 10317 | Cache Miss Rate: 51%  Number Of Misses: 10161 | Cache Miss Rate: -  Number Of Misses: - |
| **512 (0.5 KB)** | Cache Miss Rate: 56%  Number Of Misses: 11258 | Cache Miss Rate: 53%  Number Of Misses: 10631 | Cache Miss Rate: 51%  Number Of Misses: 10317 | Cache Miss Rate: 51%  Number Of Misses: 10161 | Cache Miss Rate: 39%  Number Of Misses: 7899 |
| **1024 (1 KB)** | Cache Miss Rate: 56%  Number Of Misses: 11258 | Cache Miss Rate: 53%  Number Of Misses: 10631 | Cache Miss Rate: 51%  Number Of Misses: 10317 | Cache Miss Rate: 51%  Number Of Misses: 10161 | Cache Miss Rate: 39%  Number Of Misses: 7899 |
| **2048 (2 KB)** | Cache Miss Rate: 46%  Number Of Misses: 9158 | Cache Miss Rate: 53%  Number Of Misses: 10631 | Cache Miss Rate: 51%  Number Of Misses: 10317 | Cache Miss Rate: 51%  Number Of Misses: 10161 | Cache Miss Rate: 39%  Number Of Misses: 7899 |
| **4096 (4 KB)** | Cache Miss Rate: 31%  Number Of Misses: 8172 | Cache Miss Rate: 45%  Number Of Misses: 9093 | Cache Miss Rate: 51%  Number Of Misses: 10317 | Cache Miss Rate: 51%  Number Of Misses: 10161 | Cache Miss Rate: 39%  Number Of Misses: 7899 |

**Table 2.2 Miss Rates of Column by Column Average for Direct Mapped Cache (N = 100)**

Graph 2.1 The Graph Of Miss Rate vs Block Size (Row Wise) (N = 100)

Graph 2.2 The Graph Of Miss Rate vs Block Size (Column Wise) (N = 100)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Good Hit Rate  Cache Size (bytes):  2048 (2 KB)  Block Size(words): 32 | Medium Hit Rate  Cache Size (bytes): 2048 (2 KB)  Block Size(words): 16 | Bad Hit Rate  Cache Size (bytes): 2048 (2 KB)  Block Size(words): 128 |
| Direct Mapped | Cache Miss Rate: 51%  Number Of Misses: 2583 | Cache Miss Rate: 35%  Number Of Misses: 1776 | Cache Miss Rate: 20%  Number Of Misses: 1024 |
| Fully Associative (LRU) | Cache Miss Rate: 51%  Number Of Misses: 2583 | Cache Miss Rate: 52%  Number Of Misses: 2663 | Cache Miss Rate: 20%  Number Of Misses: 1024 |
| Fully Associative (Random) | Cache Miss Rate: 48%  Number Of Misses: 2468 | Cache Miss Rate: 37%  Number Of Misses: 1885 | Cache Miss Rate: 20%  Number Of Misses: 1024 |

**b)**

**Table 3.1 Hit Rate Performances For Different Cache Designs in Column Major (N=50)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Good Hit Rate  Cache Size (bytes): 4096 (4 KB)  Block Size(words): 32 | Medium Hit Rate  Cache Size (bytes): 4096 (4 KB)  Block Size(words): 128 | Bad Hit Rate  Cache Size (bytes): 4096 (4 KB)  Block Size(words): 8 |
| Direct Mapped | Cache Miss Rate: 51%  Number Of Misses: 10317 | Cache Miss Rate: 39%  Number Of Misses: 7899 | Cache Miss Rate: 31%  Number Of Misses: 8172 |
| Fully Associative (LRU) | Cache Miss Rate: 51%  Number Of Misses: 10317 | Cache Miss Rate: 39%  Number Of Misses: 7899 | Cache Miss Rate: 13%  Number Of Misses: 2170 |
| Fully Associative (Random) | Cache Miss Rate: 49%  Number Of Misses: 9841 | Cache Miss Rate: 39%  Number Of Misses: 7899 | Cache Miss Rate: 21%  Number Of Misses: 4162 |

**Table 3.2 Hit Rate Performances For Different Cache Designs in Column Major (N=100)**

Graph 3.1 The Graph Of Miss Rate vs Block Size in Different Cache Designs (Row Major)

(N = 50)

Graph 3.2 The Graph Of Miss Rate vs Block Size in Different Cache Designs (Row Major)

(N = 100)

**c)**

|  |  |  |  |
| --- | --- | --- | --- |
| N-Way Set Associative  Cache Set Size | Good Hit Rate  Cache Size (bytes):  2048 (2 KB)  Block Size(words): 32 | Medium Hit Rate  Cache Size (bytes): 2048 (2 KB)  Block Size(words): 16 | Bad Hit Rate  Cache Size (bytes): 2048 (2 KB)  Block Size(words): 128 |
| 1 | Cache Miss Rate: 51%  Number Of Misses: 2583 | Cache Miss Rate: 35%  Number Of Misses: 1776 | Cache Miss Rate: 20%  Number Of Misses:  1024 |
| 2 | Cache Miss Rate: 49%  Number Of Misses: 2514 | Cache Miss Rate: 35%  Number Of Misses: 1776 | Cache Miss Rate: 20%  Number Of Misses: 1021 |
| 4 | Cache Miss Rate: 49%  Number Of Misses: 2492 | Cache Miss Rate: 35%  Number Of Misses: 1776 | Cache Miss Rate: 20%  Number Of Misses: 1020 |
| 8 | Cache Miss Rate: 49%  Number Of Misses: 2475 | Cache Miss Rate: 35%  Number Of Misses: 1776 | Cache Miss Rate: 20%  Number Of Misses: 1018 |

**Table 4.1 Hit Rate Performances For N-Way Cache Designs in Column Major (N=50)**

|  |  |  |  |
| --- | --- | --- | --- |
| N-Way Set Associative  Cache Set Size | Good Hit Rate  Cache Size (bytes): 4096 (4 KB)  Block Size(words): 32 | Medium Hit Rate  Cache Size (bytes): 4096 (4 KB)  Block Size(words): 128 | Bad Hit Rate  Cache Size (bytes): 4096 (4 KB)  Block Size(words): 8 |
| 1 | Cache Miss Rate: 51%  Number Of Misses: 10317 | Cache Miss Rate: 39%  Number Of Misses: 7899 | Cache Miss Rate: 41%  Number Of Misses: 8172 |
| 2 | Cache Miss Rate: 49%  Number Of Misses: 91008 | Cache Miss Rate: 38%  Number Of Misses:  7880 | Cache Miss Rate: 40%  Number Of Misses: 8170 |
| 4 | Cache Miss Rate: 49%  Number Of Misses: 91008 | Cache Miss Rate: 38%  Number Of Misses:  7756 | Cache Miss Rate: 40%  Number Of Misses: 8166 |
| 8 | Cache Miss Rate: 49%  Number Of Misses: 91008 | Cache Miss Rate: 38%  Number Of Misses: 7755 | Cache Miss Rate: 40%  Number Of Misses: 8165 |

**Table 4.2 Hit Rate Performances For N-Way Cache Designs in Column Major (N=100)**