CMSC 412 - Homework 6

1. FIFO option 1:

15 page faults

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reference string** | **2** | **4** | **5** | **6** | **1** | **5** | **3** | **4** | **5** | **2** | **3** | **6** | **5** | **3** | **4** | **7** | **3** | **5** | **6** |
| **Physical Frame 0** | 2 | 2 | 2 | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Physical Frame 1** |  | 4 | 4 | 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Physical Frame 2** |  |  | 5 | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Physical Frame 3** |  |  |  | 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Page Faults** | F | F | F | F |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Victim Frames** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reference string** | **2** | **4** | **5** | **6** | **1** | **5** | **3** | **4** | **5** | **2** | **3** | **6** | **5** | **3** | **4** | **7** | **3** | **5** | **6** |
| **Physical Frame 0** | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| **Physical Frame 1** |  | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 7 | 7 | 7 | 7 |
| **Physical Frame 2** |  |  | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| **Physical Frame 3** |  |  |  | 6 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **Page Faults** | F | F | F | F | F |  | F |  |  |  |  | F |  |  |  | F |  |  |  |
| **Victim Frames** |  |  |  |  | 6 |  | 1 |  |  |  |  | 2 |  |  |  | 4 |  |  |  |

1. OPT:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reference string** | **2** | **4** | **5** | **6** | **1** | **5** | **3** | **4** | **5** | **2** | **3** | **6** | **5** | **3** | **4** | **7** | **3** | **5** | **6** |
| **Physical Frame 0** | 2 | 2 | 2 | 2 | 4 | 4 | 5 | 6 | 1 | 3 | 3 | 4 | 4 | 5 | 2 | 6 | 6 | 3 | 4 |
| **Physical Frame 1** |  | 4 | 4 | 4 | 5 | 5 | 6 | 1 | 3 | 4 | 4 | 5 | 5 | 2 | 6 | 3 | 3 | 4 | 7 |
| **Physical Frame 2** |  |  | 5 | 5 | 6 | 6 | 1 | 3 | 4 | 5 | 5 | 2 | 2 | 6 | 3 | 4 | 4 | 7 | 5 |
| **Physical Frame 3** |  |  |  | 6 | 1 | 1 | 3 | 4 | 5 | 2 | 2 | 6 | 6 | 3 | 4 | 7 | 7 | 5 | 6 |
| **Page Faults** | F | F | F | F | F |  | F | F | F | F |  | F |  | F | F | F |  | F | F |
| **Victim Frames** |  |  |  |  | 2 |  | 4 | 5 | 6 | 1 |  | 3 |  | 4 | 5 | 2 |  | 6 | 3 |

8 page faults (best possible result)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reference string** | **2** | **4** | **5** | **6** | **1** | **5** | **3** | **4** | **5** | **2** | **3** | **6** | **5** | **3** | **4** | **7** | **3** | **5** | **6** |
| **Physical Frame 0** | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 | 6 |
| **Physical Frame 1** |  | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **Physical Frame 2** |  |  | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| **Physical Frame 3** |  |  |  | 6 | 6 | 6 | 6 | 4 | 4 | 4 | 4 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 |
| **Page Faults** | F | F | F | F | F |  | F | F |  | F |  | F |  |  | F | F |  |  | F |
| **Victim Frames** |  |  |  |  | 2 |  | 4 | 6 |  | 1 |  | 4 |  |  | 2 | 6 |  |  | 4 |

1. LRU:

12 page faults – better than FIFO

1. LFU:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reference string** | **2** | **4** | **5** | **6** | **1** | **5** | **3** | **4** | **5** | **2** | **3** | **6** | **5** | **3** | **4** | **7** | **3** | **5** | **6** |
| **Physical Frame 0** | 2 | 2 | 2 | 2 | 1 | 1 | 3 | 3 | 3 | 2 | 2 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 6 |
| **Physical Frame 1** |  | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| **Physical Frame 2** |  |  | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| **Physical Frame 3** |  |  |  | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **Page Faults** | F | F | F | F | F |  | F |  |  | F | F | F |  |  |  | F |  |  | F |
| **Victim Frames** |  |  |  |  | 2 |  | 1 |  |  | 3 | 6 | 2 |  |  |  | 6 |  |  | 7 |

11 page faults – better than FIFO and LRU