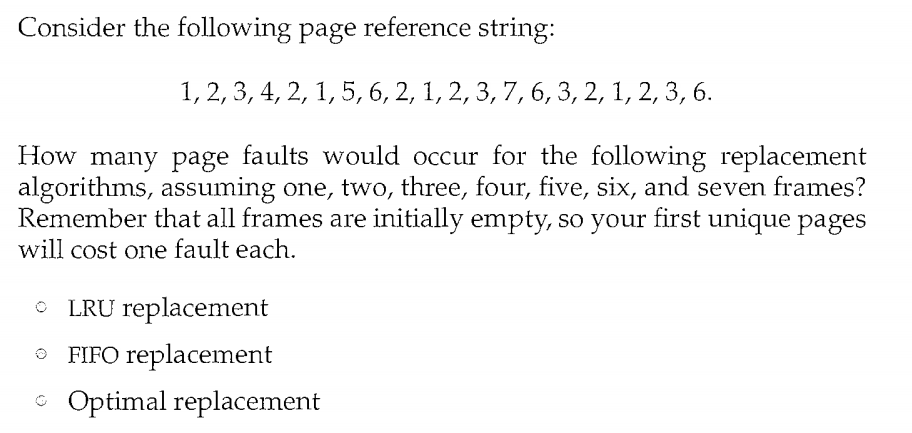
1.



**LRU**

**1 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 20 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |

**2 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 18 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 3 | 3 | 2 | 2 | 5 | 5 | 2 | 2 |  | 2 | 7 | 7 | 3 | 3 | 1 |  | 3 | 3 |
|  | 2 | 2 | 4 | 4 | 1 | 1 | 6 | 6 | 1 |  | 3 | 3 | 6 | 6 | 2 | 2 |  | 2 | 6 |

**3 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 15 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 4 |  | 4 | 5 | 5 | 5 | 1 |  | 1 | 7 | 7 |  | 2 | 2 |  |  | 2 |
|  | 2 | 2 | 2 |  | 2 | 2 | 6 | 6 | 6 |  | 3 | 3 | 3 |  | 3 | 3 |  |  | 3 |
|  |  | 3 | 3 |  | 1 | 1 | 1 | 2 | 2 |  | 2 | 2 | 6 |  | 6 | 1 |  |  | 6 |

**4 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 10 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  | 1 | 1 | 6 |  |  | 6 |  |  |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  | 2 | 2 | 2 |  |  | 2 |  |  |  |
|  |  | 3 | 3 |  |  | 5 | 5 |  |  |  | 3 | 3 | 3 |  |  | 3 |  |  |  |
|  |  |  | 4 |  |  | 4 | 6 |  |  |  | 6 | 7 | 7 |  |  | 1 |  |  |  |

**5 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 8 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  | 1 | 1 |  |  |  |  |  |  |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  | 2 | 2 |  |  |  |  |  |  |  |
|  |  | 3 | 3 |  |  | 3 | 6 |  |  |  | 6 | 6 |  |  |  |  |  |  |  |
|  |  |  | 4 |  |  | 4 | 4 |  |  |  | 3 | 3 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5 | 5 |  |  |  | 5 | 7 |  |  |  |  |  |  |  |

**6 frames**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 7 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  |  | 2 |  |  |  |  |  |  |  |
|  |  | 3 | 3 |  |  | 3 | 3 |  |  |  |  | 3 |  |  |  |  |  |  |  |
|  |  |  | 4 |  |  | 4 | 4 |  |  |  |  | 7 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5 | 5 |  |  |  |  | 5 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 6 |  |  |  |  | 6 |  |  |  |  |  |  |  |

**7 frames**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 7 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  |  | 2 |  |  |  |  |  |  |  |
|  |  | 3 | 3 |  |  | 3 | 3 |  |  |  |  | 3 |  |  |  |  |  |  |  |
|  |  |  | 4 |  |  | 4 | 4 |  |  |  |  | 4 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5 | 5 |  |  |  |  | 5 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 6 |  |  |  |  | 6 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 7 |  |  |  |  |  |  |  |

**FIFO**

**1 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 20 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |

**2 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 18 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 3 | 3 | 2 | 2 | 5 | 5 | 2 | 2 |  | 2 | 7 | 7 | 3 | 3 | 1 |  | 3 | 3 |
|  | 2 | 2 | 4 | 4 | 1 | 1 | 6 | 6 | 1 |  | 3 | 3 | 6 | 6 | 2 | 2 |  | 2 | 6 |

**3 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 16 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 4 |  | 4 | 4 | 6 | 6 | 6 |  | 3 | 3 | 3 |  | 2 | 2 |  | 2 | 6 |
|  | 2 | 2 | 2 |  | 1 | 1 | 1 | 2 | 2 |  | 2 | 7 | 7 |  | 7 | 1 |  | 1 | 1 |
|  |  | 3 | 3 |  | 3 | 5 | 5 | 5 | 1 |  | 1 | 1 | 6 |  | 6 | 6 |  | 3 | 3 |

**4 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 14 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 5 | 5 | 5 | 5 |  | 3 | 3 | 3 |  | 3 | 1 |  | 1 |  |
|  | 2 | 2 | 2 |  |  | 2 | 6 | 6 | 6 |  | 6 | 7 | 7 |  | 7 | 7 |  | 3 |  |
|  |  | 3 | 3 |  |  | 3 | 3 | 2 | 2 |  | 2 | 2 | 6 |  | 6 | 6 |  | 6 |  |
|  |  |  | 4 |  |  | 4 | 4 | 4 | 1 |  | 1 | 1 | 1 |  | 2 | 2 |  | 2 |  |

**5 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 10 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 6 |  |  |  |  | 6 |  |  | 6 | 6 |  | 6 |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  |  | 7 |  |  | 7 | 7 |  | 7 |  |
|  |  | 3 | 3 |  |  | 3 | 3 |  |  |  |  | 3 |  |  | 2 | 2 |  | 2 |  |
|  |  |  | 4 |  |  | 4 | 4 |  |  |  |  | 4 |  |  | 4 | 1 |  | 1 |  |
|  |  |  |  |  |  | 5 | 5 |  |  |  |  | 5 |  |  | 5 | 5 |  | 3 |  |

**6 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 10 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  | 7 |  |  |  | 7 | 7 | 7 |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  |  | 2 |  |  |  | 1 | 1 | 1 |  |
|  |  | 3 | 3 |  |  | 3 | 3 |  |  |  |  | 3 |  |  |  | 3 | 2 | 2 |  |
|  |  |  | 4 |  |  | 4 | 4 |  |  |  |  | 4 |  |  |  | 4 | 4 | 3 |  |
|  |  |  |  |  |  | 5 | 5 |  |  |  |  | 5 |  |  |  | 5 | 5 | 5 |  |
|  |  |  |  |  |  |  | 6 |  |  |  |  | 6 |  |  |  | 6 | 6 | 6 |  |

**7 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 7 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  |  | 2 |  |  |  |  |  |  |  |
|  |  | 3 | 3 |  |  | 3 | 3 |  |  |  |  | 3 |  |  |  |  |  |  |  |
|  |  |  | 4 |  |  | 4 | 4 |  |  |  |  | 4 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5 | 5 |  |  |  |  | 5 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 6 |  |  |  |  | 6 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 7 |  |  |  |  |  |  |  |

**Optimal**

**1 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
|  | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |

**2 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 15 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 3 | 4 |  | 1 | 5 | 6 |  | 1 |  | 3 | 3 | 3 |  | 3 | 1 |  | 3 | 3 |
|  | 2 | 2 | 2 |  | 2 | 2 | 2 |  | 2 |  | 2 | 7 | 6 |  | 2 | 2 |  | 2 | 6 |

**3 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 11 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  | 3 | 3 | 3 |  |  | 3 |  |  | 3 |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  | 2 | 2 | 2 |  |  | 2 |  |  | 2 |
|  |  | 3 | 4 |  |  | 5 | 6 |  |  |  | 6 | 7 | 6 |  |  | 1 |  |  | 6 |

**4 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 8 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  | 7 |  |  |  | 7 |  |  |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  |  | 2 |  |  |  | 2 |  |  |  |
|  |  | 3 | 3 |  |  | 3 | 3 |  |  |  |  | 3 |  |  |  | 3 |  |  |  |
|  |  |  | 4 |  |  | 5 | 6 |  |  |  |  | 6 |  |  |  | 6 |  |  |  |

**5 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 7 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  |  | 2 |  |  |  |  |  |  |  |
|  |  | 3 | 3 |  |  | 3 | 3 |  |  |  |  | 3 |  |  |  |  |  |  |  |
|  |  |  | 4 |  |  | 4 | 6 |  |  |  |  | 6 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5 | 5 |  |  |  |  | 7 |  |  |  |  |  |  |  |

**6 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 7 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  |  | 2 |  |  |  |  |  |  |  |
|  |  | 3 | 3 |  |  | 3 | 3 |  |  |  |  | 3 |  |  |  |  |  |  |  |
|  |  |  | 4 |  |  | 4 | 4 |  |  |  |  | 7 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5 | 5 |  |  |  |  | 5 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 6 |  |  |  |  | 6 |  |  |  |  |  |  |  |

**7 frame**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 2 | 1 | 5 | 6 | 2 | 1 | 2 | 3 | 7 | 6 | 3 | 2 | 1 | 2 | 3 | 6 |
| 7 page fault | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  | 2 | 2 | 2 |  |  | 2 | 2 |  |  |  |  | 2 |  |  |  |  |  |  |  |
|  |  | 3 | 3 |  |  | 3 | 3 |  |  |  |  | 3 |  |  |  |  |  |  |  |
|  |  |  | 4 |  |  | 4 | 4 |  |  |  |  | 4 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5 | 5 |  |  |  |  | 5 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 6 |  |  |  |  | 6 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 7 |  |  |  |  |  |  |  |