5. (1)first-fit:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 100KB | 500KB | 200KB | 300KB | 600KB |
|  | 212KB+112KB |  |  | 417KB |

426KB的进程保持等待

best-fit:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 100KB | 500KB | 200KB | 300KB | 600KB |
|  | 417KB | 112KB | 212KB | 425KB |

worst-fit:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 100KB | 500KB | 200KB | 300KB | 600KB |
|  | 417KB |  | 112KB | 212KB |

426KB的进程保持等待

(2)best-fit算法最能有效利用内存

7. 3个空闲页框:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | D | A | B | E | A | B | C | D | E |
| A | A | A | D | D | D | E | E | E | E | E | E |
|  | B | B | B | A | A | A | A | A | C | C | C |
|  |  | C | C | C | B | B | B | B | B | D | D |

共计6次

4个空闲页框：

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | D | A | B | E | A | B | C | D | E |
| A | A | A | A | A | A | E | E | E | E | D | D |
|  | B | B | B | B | B | B | A | A | A | A | E |
|  |  | C | C | C | C | C | C | B | B | B | B |
|  |  |  | D | D | D | D | D | D | C | C | C |

共计6次

8. (n-1)/n\*A+(m-1)/(mn)\*(A+B)+1/(mn)\*(A+B+C)

17. 页表有2^48/2^21=2^27项；而反置页表有2^32/2^21=2^11项

19. t1:{1,6,3,7,8,9,2}

t2:{3,4}

24. 0.95\*2+(25+5)\*0.05 = 3.4ms

32. 1-0.7^3=0.658

1-0.7^5=0.83193

吞吐率增加了(0.83193-0.658)/0.658=26.4%

41. P共计分为0-7八块。

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 0 | 1 | 2 | 0 | 3 | 0 | 4 | 2 | 3 | 0 | 3 | 2 | 1 | 2 | 0 | 1 | 7 | 0 | 1 |
| 7 | 0 | 1 | 2 | 0 | 3 | 0 | 4 | 2 | 3 | 0 | 3 | 2 | 1 | 2 | 0 | 1 | 7 | 0 | 1 |
|  | 7 | 0 | 1 | 2 | 0 | 3 | 0 | 4 | 2 | 3 | 0 | 3 | 2 | 1 | 2 | 0 | 1 | 7 | 0 |
|  |  | 7 | 0 | 1 | 2 | 2 | 3 | 0 | 4 | 2 | 2 | 0 | 3 | 3 | 1 | 2 | 0 | 1 | 7 |
| × | × | × | × |  | × |  | × | × | × | × |  |  | × |  | × |  | × |  |  |

缺页共计12次，费时12\*25 = 300ns

(100\*20\*0.8+300+20\*20)/20 = 115ns

平均有效访问时间为115ns

42. FIFO: 下限：n次。对每一个不同的页都只存在连续调用的情况。

上限：p次。即每一次调用的时候，所需页面都不在页框内。

LRU: 下限：n次。对每一个不同的页都只存在连续调用的情况。

上限：p次。即每一次调用的时候，所需页面都不在页框内。

47. OPT: 6次

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P1 | P2 | P3 | P1 | P4 | P5 | P1 | P2 | P1 | P4 | P5 | P3 | P4 | P5 |
| P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P3 | P3 | P3 |
|  | P2 | P2 | P2 | P2 | P2 | P2 | P2 | P2 | P2 | P2 | P2 | P2 | P2 |
|  |  | P3 | P3 | P3 | P5 | P5 | P5 | P5 | P5 | P5 | P5 | P5 | P5 |
|  |  |  |  | P4 | P4 | P4 | P4 | P4 | P4 | P4 | P4 | P4 | P4 |
| × | × | × |  | × | × |  |  |  |  |  | × |  |  |

FIFO: 10次

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P1 | P2 | P3 | P1 | P4 | P5 | P1 | P2 | P1 | P4 | P5 | P3 | P4 | P5 |
| P1 | P1 | P1 | P1 | P1 | P2 | P3 | P4 | P4 | P4 | P4 | P5 | P1 | P2 |
|  | P2 | P2 | P2 | P2 | P3 | P4 | P5 | P5 | P5 | P5 | P1 | P2 | P3 |
|  |  | P3 | P3 | P3 | P4 | P5 | P1 | P1 | P1 | P1 | P2 | P3 | P4 |
|  |  |  |  | P4 | P5 | P1 | P2 | P2 | P2 | P2 | P3 | P4 | P5 |
| × | × | × |  | × | × | × | × |  |  |  | × | × | × |

SCR: 10次(\*表示引用位为1)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P1 | P2 | P3 | P1 | P4 | P5 | P1 | P2 | P1 | P4 | P5 | P3 | P4 | P5 |
| P1\* | P1\* | P1\* | P1\* | P1\* | P2 | P3 | P4 | P4 | P4\* | P4\* | P5 | P1 | P2 |
|  | P2\* | P2\* | P2\* | P2\* | P3 | P4 | P5\* | P5\* | P5\* | P5\* | P1 | P2 | P3\* |
|  |  | P3\* | P3\* | P3\* | P4 | P5\* | P1\* | P1\* | P1\* | P1\* | P2 | P3\* | P4\* |
|  |  |  |  | P4\* | P5\* | P1\* | P2\* | P2\* | P2\* | P2\* | P3\* | P4\* | P5\* |
| × | × | × |  | × | × | × | × |  |  |  | × | × | × |

CLOCK: 7次(\*表示引用位为1)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P1 | P2 | P3 | P1 | P4 | P5 | P1 | P2 | P1 | P4 | P5 | P3 | P4 | P5 |
| P1\* | P1\* | P1\* | P1\* | P1\* | P5\* | P5\* | P5\* | P5\* | P5\* | P5\* | P5 | P5 | P5\* |
|  | P2\* | P2\* | P2\* | P2\* | P2 | P2 | P2\* | P2\* | P2\* | P2\* | P2 | P2 | P2 |
|  |  | P3\* | P3\* | P3\* | P3 | P1\* | P1\* | P1\* | P1\* | P1\* | P3\* | P3\* | P3\* |
|  |  |  |  | P4\* | P4 | P4 | P4 | P4 | P4\* | P4\* | P4 | P4\* | P4\* |
| × | × | × |  | × | × | × |  |  |  |  | × |  |  |

LRU: 7次

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P1 | P2 | P3 | P1 | P4 | P5 | P1 | P2 | P1 | P4 | P5 | P3 | P4 | P5 |
| P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 | P1 |
|  | P2 | P2 | P2 | P2 | P5 | P5 | P5 | P5 | P5 | P5 | P5 | P5 | P5 |
|  |  | P3 | P3 | P3 | P3 | P3 | P2 | P2 | P2 | P2 | P3 | P3 | P3 |
|  |  |  |  | P4 | P4 | P4 | P4 | P4 | P4 | P4 | P4 | P4 | P4 |
| × | × | × |  | × | × |  | × |  |  |  | × |  |  |

MIN: 9次

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | P1 | P2 | P3 | P1 | P4 | P5 | P1 | P2 | P1 | P4 | P5 | P3 | P4 | P5 |
| P1 | √ | √ | √ | √ | √ | √ | √ | √ | √ |  |  |  |  |  |
| P2 |  | √ |  |  |  |  |  | √ |  |  |  |  |  |  |
| P3 |  |  | √ |  |  |  |  |  |  |  |  | √ |  |  |
| P4 |  |  |  |  | √ |  |  |  |  | √ | √ | √ | √ |  |
| P5 |  |  |  |  |  | √ |  |  |  |  | √ | √ | √ | √ |

WS: 9次

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | P1 | P2 | P3 | P1 | P4 | P5 | P1 | P2 | P1 | P4 | P5 | P3 | P4 | P5 |
| P1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |  |  |  |
| P2 |  | √ | √ | √ |  |  |  | √ | √ | √ |  |  |  |  |
| P3 |  |  | √ | √ | √ |  |  |  |  |  |  | √ | √ | √ |
| P4 |  |  |  |  | √ | √ | √ |  |  | √ | √ | √ | √ | √ |
| P5 |  |  |  |  |  | √ | √ | √ |  |  | √ | √ | √ | √ |