Page replacement Algorithm

FIFO

1. string: 7,0,1,2,0,3,0,4,2,3,0,3,2

Frame Size: 4   size string = 13

F.S	7	0	1	2	0	3	0	4	2	3	0	3	2
1	7	7	7	7	7	3	3	3	3	3	3	3	3
2		0	0	0	0	0	0	4	4	4	4	4	4
3			1	1	1	1	1	1	1	1	0	0	0
4				2	2	2	2	2	2	2	2	2	2
				*		*	*	*	*		*	*	*

hit = 6   ∴ Page fault = 13 - 6 = 7

2. string: 1, 2, 3, 4, 5, 1, 3, 1, 6, 3, 2, 3

Frame Size: 4   Size: 12

FS	1	2	3	4	5	1	3	1	6	3	2	3
1	1	1	1	1	5	5	5	5	5	5	2	2
2		2	2	2	2	1	1	1	1	1	1	1
3			3	3	3	3	3	3	6	6	6	6
4				4	4	4	4	4	4	4	3	3
							*	*				*

hit = 3   Page fault = 12 - 3 = 9.

3) String – 4, 7, 6, 1, 7, 6, 1, 2, 7, 2   Frame size = 3

String length = 10

FS	4	7	6	1	7	6	1	2	7	2
1	4	4	4	1	1	1	1	1	1	1
2		7	7	7	7	7	7	2	2	2
3			6	6	6	6	6	6	7	7
					*	*	*		*	

hit = 4

Page fault = 6

4. String : 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

Frame Size = 4   String Size = 20

FS	1	2	3	4	2	1	5	6	2	1	2	3	7	6	3	2	1	2	3	6
1	1	1	1	1	1	1	5	5	5	5	5	3	3	3	3	3	1	1	1	1
2		2	2	2	2	2	2	6	6	6	6	6	7	7	7	7	7	3	3	3
3			3	3	3	3	3	3	2	2	2	2	2	6	6	6	6	6	6	6
4				4	4	4	4	4	4	1	1	1	1	1	1	2	2	2	2	2
					*	*				*						*		*		*

hit = 6   ∴ Page fault = 14

LRU (Least Remaining Used) Page Replacement:-

1. String: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2

Frame: 4   String Size = 13

F.S	7	0	1	2	0	3	0	4	2	3	0	3	2
1	7	7	7	7	7	3	3	3	3	[3]	3	[3]	3
2		0	0	0	[0]	0	[0]	0	0	0	[0]	0	0
3			1	1	1	1	1	4	4	4	4	4	4
4				2	2	2	2	2	[2]	2	2	2	[2]

Hit=7   Page fault=13-7=6

2. String: 1, 2, 3, 4, 5, 1, 3, 1, 6, 3, 2, 3

Frame = 4   String Size : 12

FS	1	2	3	4	5	1	3	1	6	3	2	3
1	1	1	1	1	5	5	5	5	5	5	2	2
2		2	2	2	2	1	1	[1]	1	1	1	1
3			3	3	3	3	[3]	3	3	[3]	3	[3]
4				4	4	4	4	4	6	6	6	6

hit = 4   Page fault = 12-4 = 8

3. String: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2
Frame = 3   String Size : 10

FS	4	7	6	7	7	6	1	2	7	2
1	4	4	4	1	1	1	[1]	1	1	1
2	-	7	7	7	[7]	7	7	2	2	[2]
3			6	6	6	[6]	6	6	7	7

         * * *   *

hit = 4

Page fault = 10 - 4 = 6

~~hit = 4~~ String: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

Frame: 4   String Size = 20

FS	1	2	3	4	2	1	5	6	2	1	2	3	7	6	3	2	1	2	3	6
1	1	1	1	1	1	1	[1]	1	1	1	[1]	1	1	1	6	6	6	6	6	[6]
2		2	2	2	[2]	2	2	2	[2]	2	[2]	2	2	2	2	[2]	2	[2]	2	2
3			3	3	3	3	5	5	5	5	5	3	3	3	[3]	3	3	3	[3]	3
4				4	4	4	4	6	6	6	6	6	7	7	7	7	1	1	1	1

    * *   * * *   * *   * * *

hit = 10

Page fault = 20 - 10 = 10

Optimal Page Replacement Algorithm :-

1. String: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2

Frame size = 4.   String Size = 13

FS.	7	0	1	2	0	3	0	4	2	3	0	3	2	hit = 7
1	7	7	7	7	7	3	3	3	3	3	3	3	3	
2		0	0	0	0	0	0	0	0	0	0	0	0	Page fault
3			1	1	1	1	1	4	4	4	4	4	4	13 − 7
4				2	2	2	2	2	2	2	2	2	2	= 6
				*		*		*	*	*	*	*		

2. String:- 1, 2, 3, 4, 5, 1, 3, 1, 6, 3, 2, 3   F.S = 4

FS	1	2	3	4	5	1	3	1	6	3	2	3	hit = 6
1	1	1	1	1	1	1	1	1	6	6	6	6	
2		2	2	2	2	2	2	2	2	2	2	2	Page fault
3			3	3	3	3	3	3	3	3	3	3	= 12 − 6
4				4	5	5	5	5	5	5	5	5	= 6
				*	*	*		*		*	*		

3. String: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2   FS = 3,

FS	4	7	6	1	7	6	1	2	7	2	hit = 5
1	4	4	4	1	1	1	1	2	2	2	
2		7	7	7	7	7	7	7	7	7	Page fault
3			6	6	6	6	6	6	6	6	= 10 − 5
				*	*	*		*	*		= 5

4. String: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6

FS	1	2	3	4	2	1	5	6	2	1	2	3	7	6	3	2	1	2	3	6
1	1	1	1	1	1	1	1	1	1	1	1	1	7	7	7	7	1	1	1	1
2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3			3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4				4	4	4	5	6	6	6	6	6	6	6	6	6	6	6	6	6
				*	*			*	*	*	*		*	*	*		*	*	*

hit = 12   Page fault = 20 − 12 = 8