## **CprE 308 Homework 3**

Department of Electrical and Computer Engineering Iowa State University

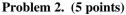
Student Name: Lily (answ. University-ID:

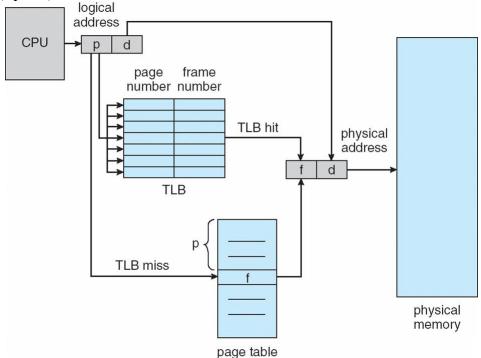
University-ID:

## Problem 1. (5 points)

Applications can be roughly classified into two types based on I/O pattern: sequential and random. Which type of applications tend to have better I/O performance on hard disk drives? Why?

Sequential and random. Which type of
Sequential and random. Which type of
Sequential is much feator because acressly data cardomly
is significantly shower and loss estherment, If a
that only read something randomly in a single
that on the read's smelly randomly in a single
that on the work has been as when it is a single
read than int work has been than 25 where I reads.
This was to have for more time to seek in the six.
This was to have for more time to seek in the six.





The figure above shows the basic workflow of paging with TLB. Assume the TLB hit ratio is  $\boldsymbol{R}$ , which means the percentage of times that a page reference is found in the TLB. Also, assume the latency of memory access is  $\boldsymbol{L}$ . Calculate the Effective Access Time (EAT) using  $\boldsymbol{R}$  and  $\boldsymbol{L}$ .

FAT: PO Nit musy time + (++). (ASS mercy due)

TCB Hil time: Send time + men ay a rest time

TCB miss time: Send time &

TCB Miss time: Send time &

TCB Not time: Send time &

TCB Not time.

EAT: Miss time. (1-Not notes) + TCB Not stree.

Not roteo

EAT: (R \* () + () - () (24)

## Problem 3. (10 points)

We can evaluate a page-replacement algorithm by running it on a particular string of memory references (reference string) and computing the number of page faults on that string. Each number in the reference string represents a page number. Assume there is a reference string as follows:

Assume the system only has three physical memory frames, and the content of the frames corresponding to the reference string above is as follows:

8	0	1	2	0	3	0	4	2	3	0	3	0	3	2	1	2	0	1	8
8	8	8	2	2	2	2	4	4	4	0	0	0	0	0	0	0	0	0	8
	0	0	0	0	3	3	3	2	2	2	2	2	2	2	1	1	1	1	1
		1	1	1	1	0	Ó	Q	3	3	3	3	3	3	3	2	2	2	2
			1		1	Ĭ	1	1	1	Ŋ					1	j			1

(1) Based on the memory content above, how many page faults are there for the given reference string?

| D | Fax | Rew H3

(2) Which page-replacement algorithm is used in the system?

LPV - Cears Recordy used

(3) Assume we extend the physical memory by adding one more frame, i.e., there are four frames in the main memory in total now. Assume the system uses Least Recently Used (LRU) page-replacement algorithm. Fill in the following table to show the content of the memory frames for the given reference string.

8	0	1	2	0	3	0	4	2	3	0	3	0	3	2	1	2	0	1	8
8	8	4	8	8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	8
	0	6	0	0	Q	0	D	0	0	0	0	0	0	0	0	8	S	Ó	0
		1	1	1	(	1	4	4	4	9	4	9	u	4	)	,	1	1	7
			て	لہ	し	と	l	し	r	v	l	U	U	2	2	1	て	2	C

IRU