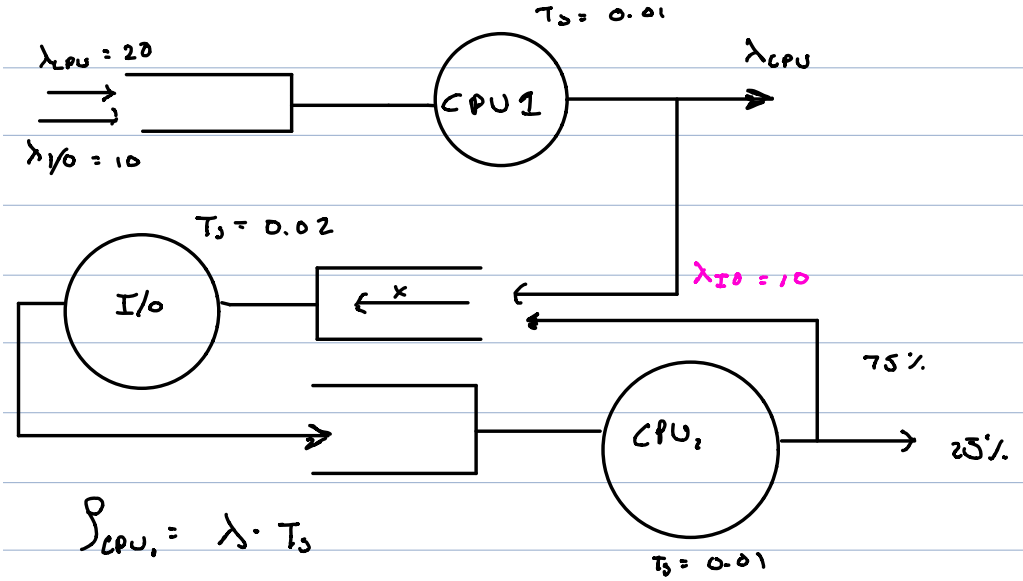
Problem 3 Mid term



$\rho_{CPU_1} = \lambda \cdot T_s$

$(20 + 10)$

$x = 30 \cdot 0.01 = 0.3$

$X = 10 + 0.75x$

$X = 40$

$\rho_{I/O} = \lambda \cdot T_s$

$= 40 \cdot 0.02 = \boxed{0.8}$ ← Bottle neck resource

ρ_{CPU_2} $40 \cdot 0.01 = 0.4$

c) Average Turn around time for CPU bound process

T_q CPU bound

$T_q = \frac{q}{\lambda}$ (Little's Law)

↓

$q = \frac{\rho}{1 - \rho}$

$q_{CPU_1} = .3/.7$

$= 0.428$

$$T_q = \frac{0.428}{30} = 0.014$$

I/O bound process will continue not exit the system

d) Average turn around time for I/O bound process

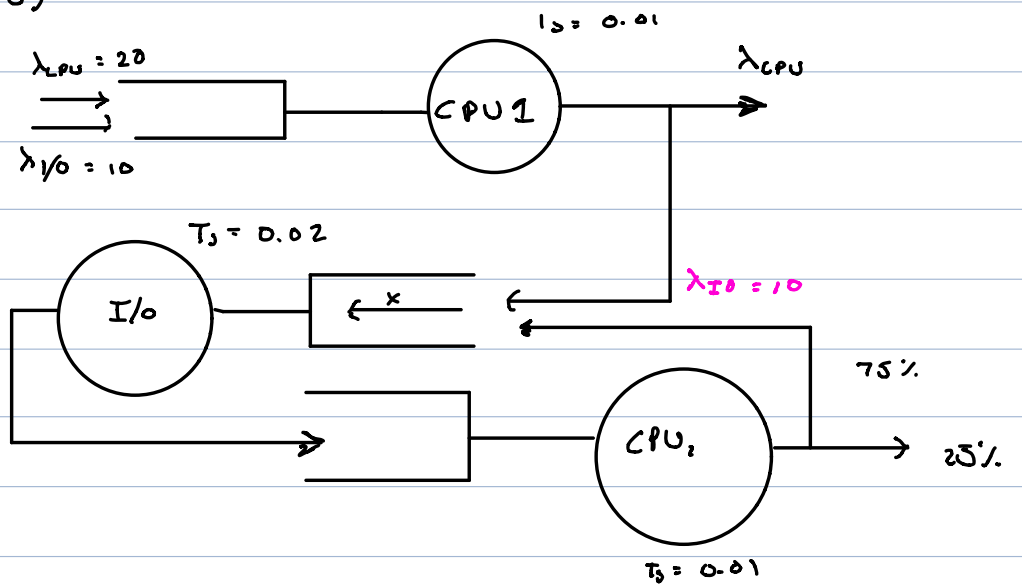
b/c it only goes through once

$$0.014 + \frac{q_{I/O} + q_{CPU_2}}{\lambda_{sub\ I/O}} \qquad q_{CPU_2} = .4/.6$$

$$0.014 + \frac{4 + 4/6}{10}$$ b/c 10 is coming in

$$= 0.4812$$

c)



To breach system set $\rho_{bottleneck} = 1$

$\therefore$

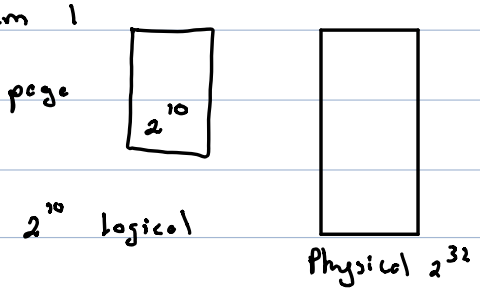
$\rho_{I/O} = 1$

$50 = \lambda^* + 0.75(50)$ — CPU bound process would break the first system

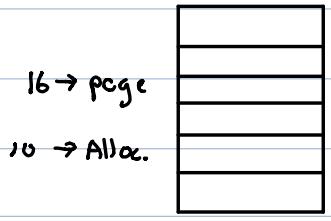
$50(0.25) = \lambda^* = 12.5$

Homework 4

Problem 1



a) How many bits in a logical address



$16 + 10 = 26$ bits

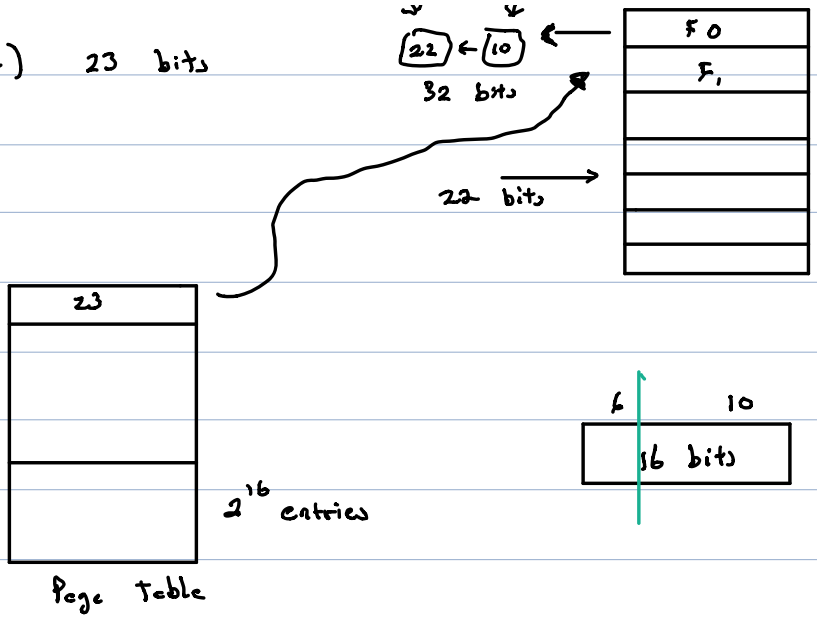
b) 2^{10} same size

c) 22 bits b/c $2^{32} / 2^{10} = 2^{22}$

d) 2^{16} b/c how many pages are already given

remaining bits — offset

c) 23 bits



Problem 2

(a) 1.2ms + 1.2ms = 2.4

(b) $0.75(0.1 + 1.2) + 0.25(0.1 + 2.4) = 10.35$ ms

Search TLB (Hit)

Problem 4

Memory has M Frames

1 2 3 4 1 3 2 1 5 4 5 ← length P

P

N = 5

a) N is lower bound

b) P every request causes a page fault

but N for N < M

but M for N = M

es// 1 2 3 1 2 3 1 2 3 1 2 3

N = 3

Problem 5

33

98 183 37 122 14 124 65 67

SSTF :

53 → 65 → 67 → 37 → 14 → 98 → 124 → 183

Scan

w/o look

53 → 37 → 14 → 0 → 65 → 67 → 98 → 122 → 124 → 183

Homework #3

Problem 1

Load A locks ∅ Adds 1

Add B locks ∅ Add 1

Store ↓ 49

A s total

B load 1 //

A locks / Add 1 ... ↓ 50

Adds 1 stotal 2

Homework 3

Problem 4

	R_1	R_2	R_3	R_4
Avelible	2	1	0	0

Current Allocation

	R_1	R_2	R_3	R_4
P_1	0	0	1	2
P_2	2	0	0	0
P_3	0	0	3	4
P_4	1	3	5	4
P_5	0	3	3	2

Max Claim

R_1	R_2	R_3	R_4
0	0	1	2
2	7	5	0
6	6	5	6
4	3	5	6
0	6	5	2

Need

(Max - Current)

R_1	R_2	R_3	R_4
0	0	0	0
0	7	5	0
6	6	2	2
2	0	0	2
0	3	2	0

	2 1 0 0	
P_1	0 0 1 2	+
	2 1 1 2	
P_4	2 3 5 4	
	4 4 6 6	
P_3	0 3 3 2	
	4 7 9 8	
P_2	2 0 0 0	
	6 7 9 8	