HW 6 - Virtual Memory

9.18 Virtual memory Space = 2^{32}
Physical memory = 2^{18}
Page Size = 4096 = 2^{12}
User process generates (Virtual address hexidecimal) = 11123456

Hexidecimal: 11123456
Binary Convert: 0001 0001 0001 0010 0011 0100 0101 0110

Page table Size = $\frac{2^{32}}{2^{12}} = 2^{20}$ → 0001 0001 0001 0010 0011

Logical address calculation parts are equivalent to the software operation. Wheras the physical calculation is equivalent to hardware

10 11 12 13 14
A B C D E

9.22
16 bits - 12 bits 16-bit Physical & Virtual
4 bits (Page #) 12 bits (offset) → 4096 (2^{12}) byte pages
[12 bits] All those Equal 12-bits

(a) 0xE12C

Hexidecimal → Binary
E (14) → 1110
1 → 0001
2 → 0010
C (12) → 1100

Page Number : E (1110)
Offset : 12C (0001 0010 1100)

[312C]

$\log_2 2^{14}$

Page	Page Frame	Reference Bit
0	9	0
1	1	0
2	14	0
3	10	0
4	—	0
5	13	0
6	8	0
7	15	0
8	—	0
9	0	0
10	5	0
11	4	0
12	—	0
13	—	0
E → 14	3	0
15	2	0

12288
2560
144
13

B) 0x3A9D → 3 (0011) Page Number: 3 (0011)
A (1010) offset: A9D (1010 1001 1101)
9 (1001) A A9D
D (1101)

C) 0x7001 → 7 (0111) Page Numbers: 7 (0111)
16^3 16^2 16^1 16^0 0 (0000) offset: 001 (0000 0000 0001)
0 (0000) F001
1 (0001)

D) 0xACA1 → A (1010) Page Number: A (1010)
C (1100) offset: CA1 (1100 1010 0001)
A (1010) 5CA1
1 (0001)

Provide a Hexadecimal that results in a page fault

B) 0x4A1D leads to a page fault...

9.27 Consider a demand-paging system with the following time-measured utilizations

CPU Utilization 20%
Paging disk 97.7%
Other I/O devices 5%

A. No
B. Yes
C. No
D. No
E. Yes
F. Yes
G. No
H. Yes