1. A system with paging memory management, has 8 GB of logical addressing space and 1 GB of physical memory. At any given time, the system's page table presents the following content:

Página	Nº de marco	Bit de validez
0	67	valido
3	10	valido
…	…	…
23	4	valido
…	…	…
42	22	valido
…	…	…
600	1	valido
…	…	…

Fill in the blank cells in the table below. Each row represents a different assumption of field distribution of the physical and logical addresses. Ignore the gray cells. Justify your result for each case by indicating the appropriate operations you have performed.

1

Fill in the blank cells with the corresponding values

	Direc. física	Direc. lógica	Tamaño de página	Nº de marcos	Nº de páginas
Caso 1				$4096=2^{12}$	
Caso 2					$1048576=2^{20}$
Caso 3	20830		$2048=2^{11}$		
Caso 4		1560000		$16384=2^{14}$	

Justifique para cada caso los valores de la tabla anterior

Caso 1	
Caso 2	
Caso 3	
Caso 4	

1. One system uses 4Kbyte pages, pagination on demand, with the maximum logical size per process being 256 pages. At a given time this system has only 6 frames (0x12, 0x13, 0x14, 0x2A, 0x2B and 0x2C) to run user processes Y and Z. Suppose that the information related to the processes Y and Z at the instant t=50 is the one shown in the following table.

PROCESO:PÁGINA	Marco (hexadecimal)	Instante de carga	Instante de última referencia	Bit Validez
Y:0x0	0x12	10	50	1
Y:0x1	0x13	15	35	1
Y:0x2				0
Y:0x3	0x14	20	20	1
Z:0x40	0x2A	12	39	1
Z:0x41	0x2B	17	17	1
Z:0x42				0
Z:0x43				0

From the instant t=50, the following sequence of pages Y:0x2, Y:0x1, Z:0x42, Z:0x43, Y:0x3, Z:0x40, Y:0x0, Y:0x3 is referenced as indicated in the tables to be completed.

a) From the instant t=50, specify for each instant t, the evolution of the content of the frames assigned to Y and Z if a FIFO replacement algorithm of GLOBAL scope is applied.

b) From the instant t=50, suppose that the system applies an fair frame distribution policy for the processes Y and Z and indicate for each instant t, the evolution of the content of the frames if a LRU replacement algorithm of LOCAL scope is applied.

c) Indicate in a justified way if in a system with paging on demand external or internal fragmentation can appear and how much memory could be unused for that reason.

1,25 Puntos (0,5+ 0,5+0,25)

1

a) FIFO replacement algorithm GLOBAL scope.

	t=50	t=51	t=52	t=53	t=54	t=55	t=57	t=58	t=59
Marco	**----**	**Y:0x2**	**Y:0x1**	**Z:0x42**	**Z:0x43**	**Y:0x3**	**Z:0x40**	**Y:0x0**	**Y:0x3**
0x12									
0x13									
0x14									
0x2A									
0x2B									
0x2C									

Numero de fallos de Página =

b) LRU replacement algorithm LOCAL scope.

	t=50	t=51	t=52	t=53	t=54	t=55	t=57	t=58	t=59
Marco	**------**	**Y:0x2**	**Y:0x1**	**Z:0x42**	**Z:0x43**	**Y:0x3**	**Z:0x40**	**Y:0x0**	**Y:0x3**
0x12									
0x13									
0x14									
0x2A									
0x2B									
0x2C									

Numero de fallos de Página =

c) External or internal fragmentation and amount of memory may be unusable

3. A computer system has a physical memory of 16MBytes and implements on-demand paging with 16-bit logical addresses and 256Byte page size. Logical memory management is based on multi-level paging with two levels and a first-level page table of 16 entries.

a) Determine the format of the logical and physical addresses.

b) Given the following set of references made by processes A and B:
(A,0x01EF),(A,0x01DF), (B,0x0213),(B,0x0302), (B,0x0489), (A,0x01FF), (B,0x0500), (A,0x03AB), (B,0x0304), (A,0x0207),(B,0x01AA)
Represent the evolution of memory assuming that processes A and B can only use frames 0, 1, 2, 3 and 4, which are initially free. The replacement algorithm is global LRU.

c) Determine the physical address corresponding to the logical address (A,0x0145)

d) Assuming that 8MBytes is reserved in main memory for the operating system and a minimum of 128 frames per process, indicate the maximum degree of multiprogramming of this system

a)
b)
c)
d)