8k =

18 bit

$2^{18} \sim 256$

15 POINTS

5. The following problem deals with a virtual memory system with **an 18 bit address space (from 0 to 262,144 (256K) locations).** The system is byte addressable and uses an **8192 (8k) bytes per page** organization. The virtual memory, therefore, is organized into **32 page frames of 8k bytes** each for each process. For this system, the physical memory is configured with 32 real pages, with the operating system itself occupying the last 6 pages permanently, and all user programs paging against the **first 26 physical pages** as they run. Remember, the 18 bit address spaces will allow each user process to have a virtual address space of **256K bytes** (32 pages) even though only 26 real pages will be available for all running users to share during execution. The current status of this system is shown below for a time when 3 processes, **A, B and C**, are active in the system. **A is presently in the running state** while B and C are in the ready state. As you look at the current CPU registers, you can see that the **running thread in process A has just fetched a JUMP instruction** from its code path. The **PROGRAM COUNTER (PC)** value shown is the (binary) **VIRTUAL address** of the JUMP instruction itself, which is now in the INSTRUCTION REGISTER (**IR**), and the JUMP instruction shows a (binary) **VIRTUAL address to jump to** as it executes.

   A. From what **REAL physical byte address** did the current JUMP instruction in the **IR** come from (i.e. what **physical address** does the IP/PC point to) ? (You can give a <page, offset> combination or the single number actual address, but **use base 10 numbers** either way)

   Give a base 10 answer <10><214>

   B. To what **REAL physical byte address** will control be transferred when the current JUMP instruction executes ?? (Remember, **a page fault can occur** if a process thread references an invalid page, and faults are satisfied by connecting a virtual page to an available free physical page.) (Again, you can give a <page, offset> combination or the single number actual address, but **use base 10 numbers** either way).

   Give a base 10 answer <13><1107>

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