[redacted]

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CS-2006 Operating system

Quiz: 5 **Memory management** Total-Marks:10

Q:1- **Combined Paging and Segmentation** **[5]**

A system uses segmentation with paging. Each segment can be up to 1 MB in size. Page size is 4 KB.

- The virtual address is **32 bits** long
- Each Page Table Entry (PTE) is 4 bytes
- There are 16 segments per process

1. How many bits are required to specify the **segment number**?

   4 bits

2. How many pages are there in **each segment**?

   256 pages

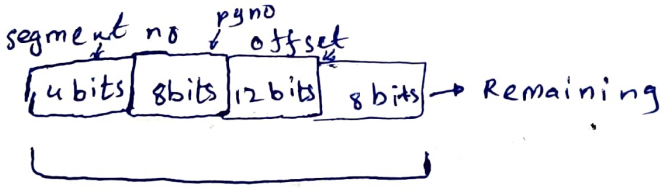
3. How many bits are needed to specify the **page number** within a segment?

   8 bits

4. How many bits are needed for the **page offset**?

   d = 12

5. Show the **final virtual address structure** by breaking it down into: Segment number, Page number, Offset and Remaining bits (if any)



virtual address = 32 bits

Q:2- Consider a system with an 8-bit virtual address space, and a 32-byte page/frame size. The page table for a process maps virtual page numbers (VPN) to physical frame numbers (PFN) as follows: (0 → 5), (1 → 3), (2 → 12), (3 → 7), (4 → 15). **[5]**

1. Translate the following virtual addresses (given in decimal) to physical addresses, indicating:
   a. **Virtual Page Number (VPN), b. Offset, c. Frame Number (PFN), d. Final Physical Address**
2. Write the final physical address in both decimal and binary.
3. Indicate if any address is invalid (i.e., the VPN is not mapped in the page table).

Given Virtual Addresses:

(a) 50 (b) 100 (c) 145 (d) 200

(a, 50
pg no = 50/32
= 1
offset = 50 % 32
= 18
frame = 3
final PA = 114

(b, 100 in binary 0110 0100 p=3 d=4
pg no = 3 frame = 7
offset = 4
PA = (frame * pg size) + offset
PA = 228

(c) 145
pg = 4
offset = 17
frame = 15
PA = 497

(d, 200
pg = 6 ;
offset = 8
invalid as 6 is not mapped