**CS604 Assignment #2 spring 2023**

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**Question No. 01 05 Marks**

Suppose a system has resource type **C** with 16 instances and 5 processes and the current system state is shown in the following table.

|  |  |  |
| --- | --- | --- |
| **Process** | **Max Need** | **Allocated** |
| P0 | 11 | 4 |
| P1 | 6 | 3 |
| P2 | 13 | 4 |
| P3 | 15 | 3 |
| P4 | 7 | 2 |

Calculate the **Need** for each resource by using the need formula and draw the **Need Matrix**.

**Solution:**

**Formula used to solve:**

Need = Max – Allocated.

|  |  |
| --- | --- |
| **Process** | **Max Need** |
| P0 | 7 |
| P1 | 3 |
| P2 | 9 |
| P3 | 12 |
| P4 | 5 |

**Question No. 2 10 Marks**

Assume a **logical address space** of 64 pages of 2048 words, each mapped into a physical

memory of 32 frames. You are required to calculate the following parameters related to paging.

No. of bits needed for **p** = ? bits

No. of bits needed for **f** = ? bits

No. of bits needed for **d** = ? bits

Logical address size = ? bits

Physical address size = ? bits

**Solution:**

No. of bits needed for **p** = ceiling [log2 64] bits = **64** bits

No. of bits needed for **f** = ceiling [log2 32] bits = **5** bits

No. of bits needed for **d** = ceiling [log2 4096] bits = **12** bits

Logical address size = |**p**| + |**d**|= 6 + 12 bits = **18** bits

Physical address size =|**f**| + |**d**| = 5 + 12 bits = **17** bits

**Question No. 03 05 Marks**

The performance measure in paging is the **effective memory access time**. With part of the page table in the TLB and the rest in the main memory. In the context of paging, you are required to calculate the **Teffective** by considering the following factors.

**Tmem** = 200 nsec

**TTLB** = 20 nsec

**Hit ratio** = 90%

Calculate the **Effective Memory Access Time** (**Teffective)** by using the formula. Show each step of the calculation.

**Solution:**

**Given:**

Tmem = 200 nsec

TTLB = 20 nsec

Hit ratio = 90%

**To solve:**

Teffective formula is:

Teffective =HR(TTLB + Tmem) + MR(TTLB) + 2Tmem

**Finding MR:**

MR = 1-hitratio = 1-90 = .10

**Finding Teffective:**

Teffective = .90(20 + 200) + .10(20 + 2 \* 200)

Teffective = 198 + 42

**Teffective = 240 nsec**

**Conclusion:**

So, the Effective Memory Access Time (Teffective) is equal to **240 nsec** after calculation.