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EXAM 1 (50MIN)

CS332-005
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100 POINTS

Name: ...SAMPLE SOLUTIONS.....

Problem 1. (40 POINTS)
TYPE A.

(1) **Ans: See (8): microprocessor, processor**

(2) (a) binary 10101010 , (b) hexadecimal 0x3a , (c) **denary 200**.

(3)
- 1200KiB **Ans: 4**
- 1MiB **Ans: 3**
- 15B **Ans: 2**
- 100bit **Ans: 1**

(4) **Ans: 0x25 is denary 37, 0x1a is denary 26. Their sum is 63. In binary this is 111111. Finally in hexadecimal this is 0x3f.**

(5) State two resources that an Operating System manages. **Ans: two of Processor, Memory, I/O Modules, SystemBus.**

(6) Harvard or **von-Neumann**?

(7) 1MiB , 32 , **32KiB**, 32MiB.

(8) **Ans: Interrupt.**

(9) **Ans: Size, Cost, Speed.**

(10) **Ans: To even out speed differences between two devices (one of the I/O related, such as disk drive, or memory)**

TYPE B.

(1) **Ans: See (8): microprocessor, processor**

(2) (a) binary 10101010 , (b) **hexadecimal 0x30a**, (c) denary 400.

(3)
- 1000KiB **Ans : 3**
- 1MiB **Ans : 4**
- 12B **Ans : 1**
- 100bit **Ans : 2**

(4) **Ans: 0x25 is denary 37, 0xa1 is denary 161. Their sum is 198. In binary this is 11000110. Finally in hexadecimal this is 0xc6.**

(5) **Ans: two of Processor, Memory, I/O Modules, SystemBus.**

(6) **Harvard** or von-Neumann?

(7) 2 , **16** , 1,024, 1,048,576.

(8) **Ans: interrupt**

(9) **Ans: Size, Cost, Speed.**

(10) **Ans: To even out speed differences between the CPU and main memory or other intermediate caches.**

Problem 2. (20 POINTS)

TYPE A. If all of them are on one processor we get $5+15+20=40$. If two of them are on one processor we have $5+15=20$, $5+20=25$, and $15+20=35$, three more possibilities; the other program on the other processor would have no greater elapsed time at 20, 15, 5 respectively. Thus the possibilities are $20, 25, 35, 40$.

TYPE B. If all of them are on one processor we get $15+20+25=60$. If two of them are on one processor we have $15+20=35$, $15+25=40$, and $20+25=45$, three more possibilities; the other program on the other processor would have no greater elapsed time at 25, 20, 15 respectively. Thus the possibilities are $35, 40, 45, 60$.

Problem 3. (20 POINTS)

TYPE A. Each job is 40 minutes, 20 minutes CPU time as shown and 20 minutes I/O wait. This is because 20min I/O wait is 50% of the 40min total. The elapsed time of the second (last) job would be 80min. (The first job would have had elapsed time 40min.)

TYPE B. Each job is 60 minutes, 30 minutes CPU time as shown and 30 minutes I/O wait. This is because 30min I/O wait is 50% of the 60min total. The elapsed time of the second (last) job would be 120min. (The first job would have had elapsed time 60min.)

Problem 4. (20 POINTS)

TYPE A. Let H be the hit ratio. Access time to the cache is 10ns and main memory 100ns; after a cache miss it would be overall $10+100=110$ns. The effective rate is 10% higher than the cache access time i.e. $1.1\times 10=11$. Then

$$1.1\times 10 = 10\times H + (1-H)(10+100) \Rightarrow 100H = 110-11 \Rightarrow H = 99/100 = 99\%.$$

TYPE B. Let H be the hit ratio. Access time to the cache is 20ns and main memory 200ns; after a cache miss it would be overall $20+200=220$ns. The effective rate is 10% higher than the cache access time i.e. $1.1\times 20=22$. Then

$$1.1\times 20 = 20\times H + (1-H)(20+200) \Rightarrow 200H = 220-22 \Rightarrow H = 198/200 = 99\%.$$