$\qquad$ ID: $\qquad$ p. 1/5

## 178330 Operating Systems

Final Examination
28 February 2008 13.00-16.00

## Instructions:

1. NO books, sheets, calculators are allowed.
2. There are 1 questions, 100 marks total, attempts ALL questions.
3. Do NOT cheat.
4. Explain the following terms: (10 marks)
1.1 Race condition
1.2 Semaphore
1.3 Mutex
1.4 Monitor
1.5 Dining Philosopher Problem
$\qquad$ ID: p.2/5
5. Draw the resource-allocation graph following allocations:

| Process | Allocated Resources | Requesting Resources |
| :---: | :---: | :---: |
| P0 | A | B |
| P1 | D | E |
| P2 | B | D |
| P3 | - | A |
| P4 | C | B, D |
| P5 | E | C |

Is there any deadlock ? If there is, which processes do involve ? (10 marks)
3. From the system snapshot at $t_{n}$, is it a safe state if total resource is 12 ? Explain

| Process | Max Need | Need at $t_{n}$ |
| :---: | :---: | :---: |
| P0 | 9 | 4 |
| P1 | 7 | 3 |
| P2 | 5 | 3 |
| P3 | 2 | 1 |

(10 marks)
4. What are relationships between pages and frames in the paging system ? ( 5 marks)
5. What are swapping and demand paging ? Which one is better? Why ? (5 marks)
6. A 64-bit CPU uses 36-bit addressing with 16 kB -page size. How many level of paging should we use ? How many bits are used for each page level ? Explain. (10 marks)
7. TLB access time is 20 times less than those of the main memory. Given a hit rate of 0.95 , what is the speed-up of systems with TLB compare to those without TLB ? (10 marks)

Name: $\qquad$ ID: $\qquad$ p. $4 / 5$
8. Given a system with 3 frames, and the following sequence of page accesses:

$$
0,4,4,4,6,4,5,1,2,4,1,3
$$

determine the number of page faults among FIFO, Optimal, and LRU page replacement algorithms ( 15 marks)
9. Why do we need files, directories, file systems, and virtual file systems? (10 marks)
10. A disk has the geometry of 255 heads, 63 sectors, and 1,024 cylinders. Given the following sequence of cylinders to be accessed:

$$
56,426,47,598,471,927,141,710,546,264,67,51
$$

and the current head position of the cylinder 13, determine the number of cylinders that the disk head must be moved for the SSTF, SCAN, and C-LOOK. (15 marks)

