

**178 330 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.
- 

1. Explain the following terms: (10 marks)

1.1 Race condition

1.2 Semaphore

1.3 Mutex

1.4 Monitor

1.5 Dining Philosopher Problem

2. Draw the resource-allocation graph following allocations:

<u>Process</u>	<u>Allocated Resources</u>	<u>Requesting Resources</u>
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

<u>Process</u>	<u>Max Need</u>	<u>Need at <math>t_n</math></u>
P0	9	4
P1	7	3
P2	5	3
P3	2	1

(10 marks)



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)