

**178 330 Operating Systems**  
Final Examination  
26 February 2006 14.00 – 17.00

**Instructions:**

1. Books are NOT ALLOWED.
  2. A single sheet of A4 note is ALLOWED.
  3. There are 11 questions, 116 marks total, attempts ALL questions.
  4. Do NOT cheat.
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1. What are differences between deadlocks and starvations ? How can we solve the problems ? (10 marks)
2. Draw the resource-allocation graph following allocations:

<u>Process</u>	<u>Allocated Resources</u>	<u>Requesting Resources</u>
P1	A	D
P2	-	B
P3	B	E
P4	C	B, D
P5	-	D
P6	E	C

Is there any deadlock ? If there is, which processes do involve ? (10 marks)

3. From the system snapshot at  $t_1$ , is it a safe state if total resource is 10 ? Prove it.

<u>Process</u>	<u>Max Need</u>	<u>Need at <math>t_1</math></u>
P1	9	4
P2	3	3
P3	6	3

(10 marks)

4. What are relationships between pages and frames in the paging system ? (5 marks)
5. What are differences between swapping and demand paging ? Which one is better ? Why ? (5 marks)
6. Why most implementations of the paging system are multi-level paging ? (5 marks)
7. How much TLB can improve the paging performance given that TLB is 50 times faster than the main memory and the hit rate is 0.99 ? (10 marks)
8. Given a system with 3 frames, and the following sequence of page accesses:  
  
3, 8, 7, 9, 7, 3, 3, 4, 6, 4, 3, 5, 1  
  
determine the number of page faults among FIFO, Optimal, and LRU page replacement algorithms (15 marks)
9. What are advantages and disadvantages of contiguous allocation, linked allocation, and indexed allocation ? (10 marks)
10. A hard disk has the geometry of 16 heads, 63 sectors, and 1,024 cylinders. Given the following sequence of cylinders to be accessed:

88, 799, 513, 645, 975, 133, 964, 366, 606

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, C-SCAN, and C-LOOK. (15 marks)

11. True or False, and why ? (3 marks each)
  - 11.1 Real-Time Linux is faster than Linux.
  - 11.2 Applications in WebOS are running on the web server.
  - 11.3 Linux is the basis of VxWorks.
  - 11.4 QNX is a hard real-time operating system because it uses microkernel architecture.
  - 11.5 Exokernel is faster than microkernel.
  - 11.6 Plan9 must be run on networks because it is distributed operating system.
  - 11.7 Microlinux is a microkernel version of Linux.