

Massey University

ALBANY CAMPUS

EXAMINATION FOR 159.335
OPERATING SYSTEMS AND CONCURRENT PROGRAMMING
Semester Two – 2001

Time Allowed: THREE (3) Hours

INSTRUCTIONS

Attempt ALL SEVEN (7) questions.

This final examination contributes 70% to the final assessment.
Calculators are permitted.

Turn over to pg.2 ...

1. (a) What is memory management? *[3 marks]*
- (b) What is a Distributed Operating System? *[2 marks]*
- (c) What is Multiprogramming? *[2 marks]*
- (d) Briefly explain the operation of a simple device driver for a keyboard. *[3 marks]*
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2. (a) Explain how a timer interrupt may be used for process preemption. *[3 marks]*
- (b) Briefly explain the main differences between the UNIX fork system call and the WIN32 CreateThread system call. *[2 marks]*
- (c) Give three reasons for using concurrent programming. *[3 marks]*
- (d) What are the main limitations of a user level implementation of threads? *[2 marks]*

Turn over to pg. 3 ...

3. (a) NTFS does not need file system consistency checking after a power failure, why?

[3 marks]

- (b) Give two different methods for performing interprocess communication (IPC).

[2 marks]

- (c) The following processes are to be scheduled

Process	Arrival Time(ms)	Burst Time(ms)
P ₁	0	3
P ₂	1	1
P ₃	2	3
P ₄	3	1

Draw scheduling diagrams and calculate the average waiting time for these processes when using the following algorithms.

- (i) FCFS
- (ii) SJF
- (iii) SRTF
- (iv) RR with $q=2$
- (v) RR with $q=4$

[5 marks]

Turn over to pg. 4 ...

4. (a) CPUs usually have an atomic testandset instruction, briefly explain how this is used to provide mutual exclusion. *[3 marks]*
- (b) How is free space managed in a FAT file system? *[2 marks]*
- (c) Give a pseudocode solution to the Bounded Buffer problem using semaphores. *[5 marks]*
5. (a) Briefly explain how deadlock can be prevented by imposing an ordering on resource acquisition. How practical is this method? *[3 marks]*
- (b) A Restaurant has three saucepans and two frying pans. Four chefs are cooking.
Chef 1 needs to use a frying pan and three saucepans.
Chef 2 needs to use a frying pan and a saucepan.
Chef 3 needs to use two frying pans and three saucepans.
Chef 4 needs to use two frying pans and a saucepan
- At a certain point in time
Chef 1 is using one saucepan.
Chef 2 is using one saucepan.
Chef 3 is using one saucepan.
Chef 4 is using one frying pan.
- i) Draw a Resource Allocation Graph for this system. *[2 marks]*
- ii) Is this system in a safe state? Prove using the safety algorithm. *[3 marks]*
- iii) Chef 2 agrees to share a frying pan with Chef 4. Is the system in a safe state? Prove. *[2 marks]*

Turn over to pg. 5 ...

6. (a) Briefly explain the difference between physical and logical memory. *[2 marks]*
- (b) Explain the purpose of the 'referenced' bit in a page table entry. *[2 marks]*
- (c) Briefly outline what an operating system must do if a read from memory causes a page fault. State any assumptions you make. *[2 marks]*
- (d) A Machine has a physical memory of three frames.
A Program generates the following page requests:
0,1,4,5,0,1,4,5,0,1,4,5
How many page faults does this sequence generate when using the following Page Replacement Algorithms?
- (i) FIFO – First In First Out
 - (ii) OPT – The Optimal Algorithm
 - (iii) LRU – Least Recently Used
- Comment on these results. *[4 marks]*
7. Give brief definitions of the following terms.
- (a) Thrashing
 - (b) Three Level Paging
 - (c) Load Balancing
 - (d) Starvation
 - (e) The Buddy System
- [10 marks]*

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