KENYA METHODIST UNIVERSITY
FIRST TRIMESTER EXAMINATIONS, APRIL 2007

FACULTY	**:**	**SCIENCES**
DEPARTMENT	**:**	**MATHEMATICS AND COMPUTER SCIENCE**
COURSE TITLE	**:**	**OPERATING SYSTEMS**
COURSE CODE	**:**	**COMP 300**
TIME	**:**	**2 HOURS**

Answer Question I and any other two questions

Question I (30 marks)

a) What are the three major activities of an operating system in regard to memory management? (3 marks)
b) Discuss the main advantages of the layered approach to operating system design. (4 marks)
c) List five services provided by an operating system. Explain how each provides convenience to the users. (5 marks)

d) Differentiate between multiprogramming systems and timeshared systems. (2 marks)
e) What are the differences between a trap and an interrupt? What is the use of each? (3 marks)
f) What resources are used when a thread is created? How do they differ from those used when a process is created? (4 marks)

g) What is meant by *busy waiting?* Explain other kind of waiting is supported by an operating system. (3 marks)

h) Explain how the following hardware components supports multiprogramming

(i) Direct Memory Access
(ii) I/O Interrupts

(6marks)

Question II (20 marks)

a) Outline the four conditions that must hold for a deadlock to occur. (4 marks)
b) Is it possible to have a deadlock involving only one single process? Explain your answer. (2 marks)
c) Suppose that the following processes arrive for execution at the times indicated. Each process will run the listed amount of time. In answering this question, use nonpreemptive scheduling.

Process	Arrival Time	Burst Time
*P*1	0.0	8
*P*2	0.4	4
*P*3	1.0	1

What is the average turnaround time and waiting time for these processes if the CPU is left idle for the first 1 unit and the SJF algorithm is used?

(4 marks)

d) What advantage is there in having different time-quantum sizes on different levels of a multilevel queuing system? (2 marks)

e) Suppose that a scheduling algorithm (at the level of short-term CPU scheduling) favors those processes that have used the least processor time in the recent past. Why will this algorithm favor I/O-bound programs and yet not permanently starve CPU-bound programs?

(3 marks)

f) (i) Give two advantages of virtual memory implementation.

(2 marks)

(i) Name three cases in which the entire program written by a programmer need not to be in the main memory. (3 marks)

Question III (20 marks)

a) Explain the difference between internal and external fragmentation. Give one way of solving the external fragmentation problem.

(3 marks)

b) None of the disk scheduling disciplines, except FCFS, are truly fair

(i) Explain why fairness is an important goal in a time-sharing system.

(3 marks)

(ii) Give three examples of circumstances in which it is important that the operating system be *unfair* in serving I/O requests.

(3 marks)

c) When do page faults occur? Describe the actions taken by the operating system when a page fault occurs. (5 marks)

d) Consider the following page reference string:

1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6

How many page faults would occur for the following replacement algorithms, assuming *4* frames? Remember that all frames are initially empty, the first unique pages will all cost one fault each.

- LRU Replacement
- FIFO Replacement

- Optimal Replacement (6 marks)

Question IV (20 marks)

a) What are the three major activities of an operating system in regard to secondary-storage management? (3 marks)

b) Explain the purpose of *open* and c*lose* operations (2 marks)

c) Some systems provide file sharing by maintaining a single copy of a file; other systems maintain several copies, one for each of the users sharing the file. Discuss the salient merits of each approach. (5 marks)

d) Briefly describe the index file allocation method. (5 marks)

e) Describe the actions taken by the kernel to execute a system call. (5 marks)