TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

UNIVERSITY EXAMINATIONS FOR DEGREE IN:
BACHELOR OF SCIENCE OF MATHEMATICS & COMPUTE SCIENCE
BACHELOR OF SCIENCE IN STATISTICS & COMPUTER SCIENCE
(BMCS 13J/BMCS 14G/BSSC 14G)

EIT 4109: OPERATING SYSTEMS

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions.
Attempt question **ONE (Compulsory)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) State what you understand by the term "swapping" **(3 marks)**

b) Define the term "aging" as used in the context of process scheduling **(2 marks)**

c) Many operating system implement the concept of multithreading:
   (i) Explain what a multithreading operating system is and give TWO examples of operating systems falling into this category **(3 marks)**
   (ii) Give a major advantages of using threads as opposed to using processes **(1 mark)**

d) Distinguish between processor bursts and 1/0 bursts **(4 marks)**

e) In the following scenarios indicate whether or not a deadlock could occur. if so, argue why the four conditions necessary for a deadlock could become true. If not indicate which of the conditions will never become true. We have $n \geq 2$ processes which access shared resources R_1, R_2 and R_3 and each of these resources has an associated semaphore S_1, S_2 and S_3. To access calls V(si) when finished. A process may only hold one resource at a time and may acquire them in any order **(5 marks)**

f) A computer has 6 tape drives with n processes competing for it. Each process may need 2 drivers for which values of n is the system deadlock free **(10 marks)**

g) State the real difficulty with SJF in short term scheduling **(2 marks)**

Question Two

a) Provide a solution for external fragmentation **(3 marks)**

b) Suppose that your operating system does not support preemption, neither a process/thread can only be context-switched.
   1) If it blocks to wait an 1/0 or
   2) If it voluntarily gives up the CPU using the routine yield ( )

   Following is a pair of code snippets which represents the operating of two threads with one shared variable g, which is accessed within a critical section.
   (i) List THREE criteria that a solution to the critical section problem must satisfy **(3 marks)**
   (ii) Indicate whether together the two threads properly implement a critical section delineated by the comments in the code. If not, explain which of the criteria is not met, and why (you only need to mention one criteria if you think that more than one applies)

Thread 1	Thread 2
While (1)	While (1)
{ yield ( );	{ /* critical section begins */
/*critical section begins*/	y = g + 1
g = g + 1;	g = g – 2;
g = g – 2;	/* critical section ends */
/* critical section ends */}	Yield ( );}

(6 marks)

c) Discuss the basic functions of an operating system **(8 marks)**

Question Three

a) In the OS, each process is represented by its PCB (Process Control Block). Describe three of the types of information represented by a PCB **(9 marks)**

b) Two main approaches to reuse free memory area in a heap are best fit and first fit memory allocation strategies. Differentiate between the two. **(6 marks)**

c) Describe the importance of a CPU scheduler **(5 marks)**

Question Four

a) List and explain the FOUR necessary conditions of deadlock prevention **(8 marks)**

b) A system contains 10 units of resource class RU The resource requirements of three user processors P_1, P_2 and P_3 are as follows:

	P_1	P_2	P_3
Maximum	8	7	5
Requirements			
Current collection	3	1	3
Balance	5	6	2

New Request made	1	0	0

Using Banker's algorithm, determine if the projected allocation state is safe and whether the request of P1 will be granted or not **(12 marks)**

Question Five

a) Distinguish between the following FOUR terms: **(4 marks)**
   (i) Throughput,
   (ii) Turnaround times
   (iii) Waiting times and;
   (iv) Response time

b) State with the use of an example why a real time operating system for mission critical systems has well defined fixed time constraints **(2 marks)**

c) Trace the history of operating systems explain at least FOUR major concept that were critical to operating systems as we know them today **(9 marks)**

d) A primary difference between the short term and long term scheduler is in their frequency of execution. Explain the difference. **(5 marks)**