# UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/ DEC 2018

**COURSE NO**: CE 375
**COURSE NAME**: OPERATING SYSTEMS
**CLASS**: CE III **TIME:** 3HRS

Name**:** _____Index Number: _____

***Answer ALL QUESTIONS***

**Question One** **(12 marks)**

a) Define a device driver and explain three ways device drivers can be put in the kernel. **(3.5 marks)**

b) Briefly explain the functions of three typical registers found in the Processor. **(3 marks)**

c) Explain two advantages and disadvantages of the *time-shared operating system*. **(2 marks)**

d) Draw the typical bus structure showing its sub-assemblies and briefly describe the nature and functions of the each sub-assembly. **(3.5 marks)**

**Question Two** **(12 marks)**

a) Define a *process* in computing and explain four conditions that can cause a process to terminate. **(2 marks)**

b) Define a system call in computing and explain what the following system calls in Unix implement: **(2.5 marks)**

i. getpid()
ii. chown()
iii. exit()
iv. chmod()

c) Explain four reasons why *interprocess communication* is relevant in computing. **(3 marks)**

**d)** Briefly explain how the shared memory model used in interprocess communication works. **(3 marks)**

e) Draw the *many-to-many hybrid thread model* and state two of its advantages. **(1.5 marks)**

**Question Three (12 marks)**

a) Briefly explain process synchronization and state three reasons why it is important. **(2.5 marks)**

b) Define *deadlock* and briefly explain the four conditions which if present simultaneously could cause a deadlock. **(3 marks)**

c) Define a *semaphore*, briefly explain how they are used in synchronization and give one reason why they may be preferred over *monitors*. **(4 marks)**

d) State two advantages and one disadvantage of *mutexes*. **(2.5 marks)**

**Question Four** **(12 marks)**

a) Define scheduling and briefly explain the differences between non-preemptive and preemptive scheduling. **(3 marks)**

b) State two disadvantages each of the following scheduling algorithms: **(2 marks)**

i. Shortest Time Remaining Next

ii. Shortest Job First

c) Explain the differences between a *periodic process* and an *aperiodic process.* **(2 marks)**

d) Using the Shortest Time Remaining Next scheduling technique and Table 1 below:

i. Draw the Gantt chart for the five processes. **(1.5 marks)**

ii. Show in a tabular form, the start, wait, completion, turnaround and normalized turnaround times for the five processes. **(2.5 marks)**

iii. Compute the CPU utilization based on this scheduling technique. **(1 marks)**

| Process | P1 | P2 | P3 | P4 | P5 |
|---|---|---|---|---|---|
| CPU-burst (ms) | 5 | 10 | 3 | 6 | 2 |
| Arrival Time (ms) | 0 | 7 | 9 | 11 | 18 |

**Question Five** **(12 marks)**

a) Explain an address space under memory management. **(1 mark)**

b) Define virtual memory and list four benefits of having virtual memory. **(3 marks)**

c) Briefly explain how free memory is managed using *linked list*. **(3 marks)**

d) Explain two advantages and one disadvantage of demand paging **(3 marks)**

Describe how the First-In, First-Out page replacement algorithm works and give one advantage and one disadvantage of this algorithm. **(2 marks)**

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