UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

MAIN EXAMINATION, DECEMBER 2015

Title of Paper   :   **Operating Systems**

Course Number   :   **CS 442**

Time Allowed   :   **Three (3) Hours**

Instruction   :   **Answer any FIVE questions**

This exam paper should not be opened until permission has been granted by the invigilator.

1.

    a)   Describe an operating system in terms of resource management and extended machine.   **[12]**

    b)   How do real time systems differ from time sharing systems?   **[8]**

2.

    a)   Define a deadlock. What are the necessary conditions for a deadlock?   **[3+4]**

    b)   Discuss the pros and cons of the Ostrich algorithm for deadlocks.   **[10]**

    c)   Differentiate a deadlock from a race condition.   **[3]**

3.

    a)   Define a process. Identify and explain all its transitions states.   **[10]**

    b)   Name and explain the components of process scheduling   **[10]**

4.

    a)   Define the following terms: throughput, system call, critical sections   **[6]**

    b)   Given memory partitions of 500K, 200K, 300K, 600K (in this order), how would each of the **First-fit** and **Best-fit** algorithms place processes of 212K, 417K, 112K and 426K (admitted in that order)?   **[8]**

    c)   Which algorithm in b) makes the most efficient use of memory, why?   **[6]**

5.

    a)   Discuss the dining philosopher's problem and outline a solution to it.   **[10]**

    b)   How can semaphores and semaphores solution be implemented?   **[10]**

6.

    a)   Compare and contrast a buddy system and a swapping system.   **[8]**

    b)   Differentiate between a physical address and a virtual address.   **[4]**

    c)   A computer has 2 GB of RAM of which the operating system occupies 512MB. The processes are all 128MB and have the same characteristics. If the goal is 99% CPU utilization, what is the maximum I/O wait that can be tolerated?   **[8]**