B

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, MAY 2016

Computer Science and Engineering

(Computer Science)

01CS6104 Operating System Design

Max. Marks : 60   Time: 3 Hours

Answer any **Two full questions** from each part

Part A

1.
   a. How does the Linux process scheduler ensure a fair share of its computational power among the executing processes? What would have been the problem if a binary search tree was used instead of a Red Black tree as the runqueue?   (3+2)

   b. How is process context different from interrupt context?   (2)

   c. Can we use work queues in an Interrupt Context? Justify your answer.   (2)

2.
   a. By default the child process starts execution in Linux. What is the reason behind this?   (2)

   b. How is TASK_INTERRUPTIBLE state different from TASK_UNINTERRUPTIBLE state? Suppose a process is waiting for a specific event to happen. Which state should it be assigned?   (2)

   c. Why are interrupt handlers divided into Top and Bottom halves? Explain with an example.   (3)

   d. What are the differences between Tasklets and SoftIRQs?   (2)

3.
   a. What is the role of system calls in Linux? Explain with an example.   (2)

   b. What is a task list? When are individual members of a task list deallocated?   (4)

   c. When and how are SoftIRQs executed?   (3)

Part B

4.
   a. Explain true concurrency and pseudo concurrency with suitable examples.   (6)

   b. What is the relationship between Tick Rate, HZ and Jiffies?   (4.5)

5.

a. What trouble arises if a kernel code which has acquired a spin lock is interrupted by an Interrupt handler trying to acquire the same spin lock? Is it possible to avoid such a situation? How? (6)

b. What is the difference between vmalloc() and kmalloc()? Which of these must be used for allocating memory for hardware devices? Why? (4.5)

6.

a. What is the purpose of using reader-writer locks? (3)

b. How is a mutex different from a semaphore? (3)

c. Explain the following. (2 +.2.5)

a) Per CPU Allocation.

b) Dentry object

Part C

7.

a. What is the difference between a block device and a character device? Give examples. (2)

b. What is the role of an I/O scheduler? (2.5)

c. How can a client and server communicate with each other? What are the major issues, advantages and disadvantages associated with each of them? (6)

8.

a. Before the 2.6 kernel, buffer head was used for block I/O whereas in the later kernels, it has been replaced by biostructure as the basic container for block I/O. Why? (4.5)

b. Represent a consistent and inconsistent global state for the following process/event graph. (3)
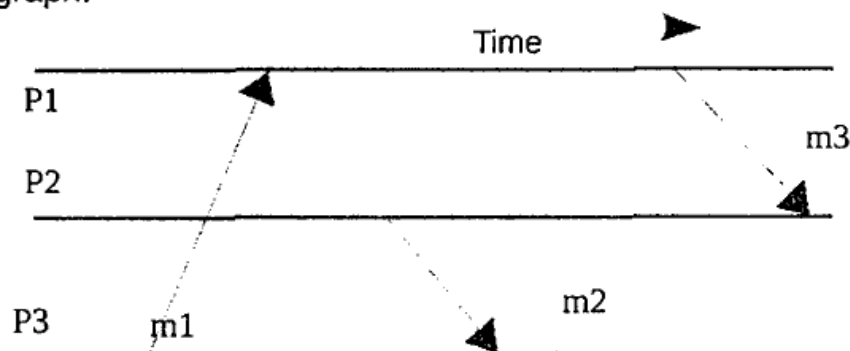
c. Explain the distributed snapshot algorithm. (3)

9.

a. What drawback of the deadline I/O scheduler is overcome by the Anticipatory I/O scheduler? (4.5)

b. Explain Lamport's timestamp algorithm with an example. (6)