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Question Paper Code : X 20396

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fourth/Fifth/Sixth Semester
Computer Science and Engineering
CS 6401 – OPERATING SYSTEMS
(Common to Information Technology, Electronics and Communication Engineering, Instrumentation and Control Engineering, Medical Electronics)
(Regulations 2013)
(Also Common to PTCS 6401 – Operating Systems for B.E. Part-Time – Third Semester – Computer Science and Engineering – Regulations 2014)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Do timesharing differs from Multiprogramming ? If so, how ?
2. Why API's need to be used rather than system calls ?
3. Distinguish between CPU-bounded and I/O bounded processes.
4. What resources are required to create threads ?
5. What is the difference between a user-level instruction and a privileged instruction ?
6. Will optimal page replacement algorithm suffer from Belady's anomaly ? Justify your answer.
7. A disk has 26310 cylinders, 16 tracks and 63 sectors. The disk spins at 7200 rpm. Seek time between adjacent track is 1 ms. How long does it take to read the entire disk ?
8. Identify the two important functions of Virtual File System (VFS) layer in the concept of file system implementation.
9. State the components of the Linux system.
10. Define the function of Caching-only serves.

PART – B **(5×13=65 Marks)**

11. a) i) Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs. **(7)**

ii) What are the advantages and disadvantages of using the same system call interface for manipulating both files and devices ? **(6)**

(OR)

b) i) State and explain the major activities of an operating system with regard to file management. **(7)**

ii) Discuss the different multiprocessor organizations with block diagrams. **(6)**

12. a) Consider the following set of processes, with the length of the CPU – burst time in given ms :

Process	Burst Time	Arrival Time
P1	8	0.00
P2	4	1.001
P3	9	2.001
P4	5	3.001
P5	3	4.001

Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, priority and RR (quantum = 2) scheduling. Also calculate waiting time and turnaround time for each scheduling algorithms. **(13)**

(OR)

b) What is a race condition ? Explain how a critical section avoids this condition. What are the properties which a data item should possess to implement a critical section ? Describe a solution to the Dining philosopher problem so that no races arise. **(13)**

13. a) Consider the following page reference string 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 4, 5, 3. How many page faults would occur for the following replacement algorithms ? Assume four frames and all frames are initially empty.

i) LRU replacement

ii) FIFO replacement

iii) Optimal replacement.

(OR)

b) i) With a neat sketch, explain how logical address is translated into physical address using Paging mechanism. **(8)**

ii) Write short notes on Memory mapped files. **(5)**

14. a) On a disk with 200 cylinders, numbered 0 to 199, compute the number of tracks the disk arm must move to satisfy the entire request in the disk queue. Assume the last request received was at track 100. The queue in FIFO order contains requests for the following tracks. 55, 58, 39, 18, 90, 160, 150, 38, 184. Perform the computation to find the seek time for the following disk scheduling algorithms.
    i) FCFS
    ii) SSTF
    iii) SCAN
    iv) C-SCAN
    v) LOOK.

(OR)

b) i) Discuss the functions of files and file implementation. **(7)**

ii) Explain free space management with neat example. **(6)**

15. a) i) Why is live migration possible in virtual environments but much less possible for a native operating system ? **(7)**

ii) What are the primary goals of the conflict-resolution mechanism used by the Linux kernel for loading kernel modules ? **(6)**

(OR)

b) Explain the step-by-step procedure for setting up a Linux multifunction server.

PART – C **(1×15=15 Marks)**

16. a) Explain how semaphore can used as synchronization tool. Consider a coke machine that has 10 slots. The producer is the delivery person and the consumer is the student using the machine. It uses the following three semaphores :

semaphore mutex

semaphore fullBuffer /* Number of filled slots */

semaphore emptyBuffer /* Number of empty slots */

    i) Write pseudo code for delivery_person( ) and student ( ).
    ii) What will be the initial values of the semaphores ?
    iii) Write a solution that guarantees the mutual exclusion and has no deadlocks.

(OR)

b) Explain the deadlock prevention method of handling deadlock.

Consider the following information about resources in a system :

i) There are two classes of allocatable resource labeled R1 and R2.

ii) There are two instances of each resource.

iii) There are four processes labeled p1 through p4.

iv) There are some resource instances already allocated to processes as follows :

- One instance of R1 held by p2, another held by p3
- One instance of R2 held by p1, another held by p4.

v) Some processes have requested additional resources, as follows :

- p1 wants one instance of R1
- p3 wants one instance of R2.

1) Draw the resource allocation graph for this system.

2) What is the state (runnable, waiting) of each process ? For each process that is waiting indicate what it is waiting for.

3) Is this system deadlocked ? If so, state which processes are involved. If not, give an execution sequence that eventually ends, showing resource acquisition and release at each step.

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