Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Sixth Semester B. Tech. (CS/IT)

Summer Term - 2016

Course Code: CSU 602

Course Name: Operating System Design

Time: 2 hr.30min. **Max.Marks: 6**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

1 Solve 12

a Describe the five major activities of an operating system with regard to file management. What are the advantages of using the same system call interface for manipulating both files and devices?

b Describe the differences among short-term,

medium-term and long term scheduling. Describe which of the scheduler will be invoked under each of the following conditions:

(i) A process completes its time slice
(ii) A process completes its required I/O
(iii) A process finishes its execution
(iv) A process request for an I/O
(v) A process is newly created
(vi) A suspended process is swapped to disk

2 Solve 12

a Consider a system running ten I/O bound tasks issue an I/O operation once for every millisecond of CPU computing and that each I/O operation takes 10 millisecond to complete. Also assume that the context switching overhead is 0.1 millisecond and that all processes are long running tasks. What is the CPU utilization for a round-robin scheduler when –

(i) The time quantum is 1 millisecond
(ii) The time quantum is 10 millisecond

b Differentiate between :

(i) Critical Section and Critical regions
(ii) Semaphore and Monitor
(iii) Deadlock preventation and deadlock avoidance

3 Solve any **Two** 12

a What is meant by kernel synchronization under Linux? Describe how it is implemented in Linux?

Cont.

b Given memory partitions of 100K,500K, 200K,400K,300K and 600K(in order), how would each of first-fit, best-fit and worst-fit algorithms place processes of 210K,415k,105k and 425k (in order)? Which is the most efficient in terms of memory usage and why?

c With reference to Linux, differentiate between:

(i) Fork and clone system calls
(ii) Block device and character device
(iii) File object and file system object

4 Solve any Two 12

a Compare and contrast various methods of file allocation.

b Consider the following reference string in a virtual memory system:
2,3,6,1,2,3,4,2,1,5,6,3,1,2,3,6,7,3,2,1
How many page faults would occur for each of the following replacement algorithms if number o frames is 4 , initially all the frames are empty:

LRU,FIFO, OPTIMAL

c What is meant by "consistency semantics"? Describe consistency semantics deployed in modern operating system.

5 Solve any Two 12

a Describe following parts of process context under Linux operating system: Scheduling context, Accounting, File table, File system context, Signa Handler table, Virtual memory context.

b With the help of neat diagram, describe the components of Linux system, giving the function of kernel, system libraries and the system utilities.

c With reference to file recovery, explain the techniques of consistency checking, Backup and restore.

Cont.

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1. Solve any Two

(a) What do you mean by System Calls? State and explain different categories of System Calls **6M**

(b) Define Process? Explain the different state of process? Describe the reason for transition from one state to another. **6M**

(c) Explain inter process communication. And Difference between direct and indirect communication. **6M**

2 **Solve any Two**

(a) What is Semaphore? What are the different operations define for semaphore? Give an implementation of Semaphore. 6M

(b) What are the different synchronization problems? Explain each one. 6M

(c) What is Critical Region ? How it is used to Solve the Critical Section Problem. Explain with Example. 6M

3. **Solve**

(a) Under What Circumstances do page fault occure? Describe the actions taken by operation System when page fault occure. 6M

(b) State the necessary Condition for a deadlock to occur. Consider the following snapshot of a System : 6M

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P_0	0 0 1 2	0 0 1 2	1 5 2 0
P_1	1 0 0 0	1 7 5 0	
P_3	1 3 5 4	2 3 5 6	
P_4	0 6 3 2	0 6 5 2	
P_5	0 0 1 4	0 6 5 6	

What is the content of Matrix need? Is the system is in safe state? if a request from process p_1 arrives for (0,4,2,0)can the request be granted immediately?

4 **Solve**

(a) Consider the following Page-reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. **6M**
How many page fault would occure for the following replacement algorithms assuming one, two, three, four, five, six, or seven frames? Remember that all the frames are initially empty, so your first unique pages will cost one fault each

(a) LRU replacement
(b) FIFO replacement
(c) Optimal replacement

(b) What is the cause of thrashing? How does the system detect Thrashing? Once the system detect thrashing, what can the system do to eliminate this problem? **6M**

5. **Solve any TWO**

(a) With the reference of process scheduling under Linux explain the scheduling for time sharing, processes and real-time scheduling. **6M**

(b) Explain the networking structure of Linux With the different layers implementation. **6M**

(c) Differentiate between **6M**
(a) Buffering and cashing
(b) Buffering and spooling
(c) i/o scheduling and buffering

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B. Tech. (Computer Science &Engineering)

SUMMER- 2017

Course Code: CSU602

Course Name: Operating System Design

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1. **Solve any TWO**

a What are the different operating system services? Explain in brief with example. **6M**

b. Draw and Explain the UNIX system structure. **6M**

c What is the purpose of interrupts? What are the differences between a trap and an interrupt? Can traps be generated intentionally by a user program? If so, for what purpose? **6M**

2 **Solve**

a. Consider the following five process **6M**

Process	P0	P1	P2	P3	P4
Arrival Time	2	4	8	6	0
Burst time	5	7	6	2	8

Cont.

Compute and prepare comparison chart for waiting time, Turn Around Time of each process for FCFS,SJF,RR(Q=2)

b. What is the difference between user level tread and kernel level thread? Under what circumstances one in the type better than other? Describe the action taken by the tread library to context switch user level tread. **6M**

3 **Solve any Two**

a. Justify Peterson solution to the critical-section problem must satisfy the mutual exclusion, progress and bounded waiting. **6M**

b. Illustrate that with example, if the wait( ) and signal( ) semaphore operations are not executed atomically, and then mutual exclusion may be violated. **6M**

c What is the meaning of term busy waiting? What other kind of waiting is there in an operating system? Can busy waiting be avoided? Justify with example **6M**

4. **Solve**

a. **6M**

Process	*Allocation*	*Max*	*Available*
	A B C D	*A B C D*	*A B C D*
P0	0 0 1 2	0 0 1 2	1 5 2 0
P1	1 0 0 0	1 7 5 0	
P2	1 3 5 4	2 3 5 6	
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

Write and apply the banker's algorithm to check safe state or not for above snapshot and find the Need.

a. If a request from process P2 arrives for (1, 0, 0,

0), can the request be granted immediately?

b. Consider the following page reference string **6M**
1 2 3 4 2 1 5 6 2 1 2 3 7 6 3 2 1 2 3 6
How many page fault would occur for the following page replacement algorithm by assuming three frames? All frames are initially empty

1. LRU Page replacement
2. Optimal Page replacement
3. FIFO page replacement

5. Solve any TWO

a. Explain layered file system structure in detail **6M**

b How acyclic graph directory is helpful for file sharing? Illustrate hard link and soft link approaches for file sharing. **6M**

c Explain Security in linux with example **6M**

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1		**Solve any Two**	
	a	List and Explain Services provided by operating System	**6M**
	b	What is an operating system? Explain User view and System view	**6M**
	c	List different categories of System call. Explain Device management system call in brief	**6M**
2	a	What is critical region? How semaphore is used in critical section problem? Illustrate with example	**6M**
	b	Consider the following set of processes, with	**6M**

length of CPU-burst time in the milliseconds:

Process	Burst Time	Arrival Time	Priority
P1	12	0	3
P2	8	2	1
P3	2	4	4
P4	5	6	2

Draw Gantt Chart illustrating the execution of the processes using SJF, Priority scheduling and RR (quantum=3) scheduling. What is the turnaround time and waiting time of each process for each of the scheduling?

3 a How to find out whether or not system is in safe state for resources has multiple instances? Explain with example **6M**

b What are the necessary conditions for the deadlock to exist? How will you prevent deadlocks? **6M**

4 **Solve any Two**

a Consider the following page reference string **6M**
7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1
How many page fault would occur for the following replacement algorithm, assume frame size is three and all frames are empty initially
i) LRU ii.) Optimal Replacement iii) FIFO

b What is virtual memory? how it is implemented in demand paging **6M**

c When does trashing occur? Explain the causes of trashing **6M**

5 a **Solve any Two**
Which is the slandered on-disk file system used **6M**

by Linux? Explain block allocation policies for it

b	Explain the general graph directory structure	**6M**
c	Explain the three layer of software implemented by Linux kernel	**6M**

6M

6M

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