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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May / June 2019 Semester End Main Examinations

Programme: B.E.
Branch : Information Science and Engineering
Course Code: 15IS4DCOPS
Course: Operating System

Semester : IV
Duration: 3 hrs.
Max Marks: 100
Date: 04.06.2019

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) Outline the operating system structure of layered approach and micro kernels. **12**

b) Illustrate how the operating system handles a user application invoking the open ( ) system call. **08**

UNIT - II

2 a) Discuss three ways of establishing relationship between user and kernel threads. **04**

b) Provide the solution using semaphores by modifying the wait ( ) and signal ( ) definition to overcome the need for busy waiting. **06**

c) Explicate any two classical problems of synchronization. **10**

UNIT - III

3 a) Explain the following CPU scheduling criteria: **04**
I. CPU utilization
II. Throughput
III. Turnaround time
IV. Waiting time

b) Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here: **10**

Process	Burst	Priority
P_1	8	4
P_2	6	1
P_3	1	2
P_4	9	2
P_5	3	3

i. Suppose a system uses Non preemptive Priority scheduling. Draw a Gantt chart. Assuming lowest number as higher priority.
ii. Suppose a system uses RR scheduling with a quantum of 1. Draw a Gantt chart with ready queue illustrating the execution of these processes?
iii. What is the turnaround time and waiting time for both i. and ii.?

c) What is a safe state? Discuss the statement 'Deadlock state is an unsafe state, but an unsafe state is not a deadlock state'. **06**

OR

4 a) Draw a resource-allocation graph for the following situation and check if the system is in deadlock or not. **05**

Process P1 is (holding) using resource R2 and waiting for resource R1,
P2 is using R1 and waiting for R3, R4 and R5,
P3 is using R4 and waiting for R5,
P4 is using R5 and waiting for R2,
P5 is using R3.

b) Consider the following snapshot of a system: **10**

	ALLOCATION			MAX			*AVAILABLE*		
	A	B	C	*A*	B	C	*A*	*B*	*C*
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Solve the following questions using the banker's algorithm:
i. What is the content of the matrix *Need*?
ii. Is the system in a safe state?
iii. If a request from process *P1* arrives for (1,0,2), can the request be granted immediately?

c) Illustrate with examples the Peterson's solution for critical section problem and prove that mutual exclusion property is preserved. **05**

UNIT - IV

5 a) What is paging? Explain with figure how the logical address is converted to physical address? **08**

b) Give differences between internal fragmentation and external fragmentation with examples. **04**

c) Show how working set model will prevent thrashing and optimizes CPU utilization. **08**

OR

6 a) Explicate segmentation technique of memory management with the help of a neat diagram. **06**

b) Consider the following page reference string: **10**
7,2,3,1,2,5,3,4,6,7,7,1,0,5,4,6,2,3,0,1
Assuming demand paging with three frames, how many page faults would occur for the following replacement algorithms?
I. LRU replacement
II. Optimal replacement

c) Define thrashing. How is thrashing caused? **04**

UNIT - V

7 a) Suppose a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 53 and the previous request was at cylinder 24. The queue of pending requests, in FIFO order is : **12**
98, 183, 37, 122, 14, 124, 65, 67
Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?
I. FCFS
II. C-SCAN
III. LOOK
Compare the results and justify which algorithm works better?

b) Explain the architecture of Linux system with a neat diagram. **08**

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B. M. S. College of Engineering, Bengaluru - 560019

Autonomous Institute Affiliated to VTU

JAN / FEB – 2021 Grade Improvement Examinations of Even Semester

Programme: B.E. **Semester: IV**
Branch : COMPUTER SCIENCE AND ENGINEERING **Duration: 3 hrs.**
Course Code: 19CS4PCOPS **Max Marks: 100**
Course: Operating System **Date: 22.02.2021**

Instructions to Candidates (Shall Include instruction regarding issue of Charts / Tables etc.,)

Q No.		Marks
	Unit I	
1.a.	Compare multiprocessor systems over single processor systems.	6
1.b.	Illustrate how a user application can use service of the underlying operating system.	8
1.c.	If a process requires 200 milliseconds to execute and a CPU takes 10 milliseconds to decide. Calculate CPU utilization. Suggest a suitable process mix for better system performance	6
	Unit II	
2.a.	Identify the challenges in programming multicore systems	6
2.b.	Which of the following scheduling algorithms could result in starvation. Justify I. First Come, first-served II. Shortest Job first III. Round robin IV. Priority	6
2.c.	Consider the following set of processes, with the given length of the CPU burst and arrival time given in milliseconds	8

Process	Burst time	Arrival time
1	5	0
2	9	3
3	6	6

Consider the following scheduling methods
i) FCFS
ii) SJF
iii) RR (Quantum =2)
iv) Multilevel Feedback Queue and
Calculate average turnaround time and average waiting time.

	Unit III	
3.a.	Show that mutex lock can be used to solve critical-section problem.	6
3.b.	Describe how the following protocols prevent deadlock. i) Hold and Wait ii) Circular wait	6

3.c. Consider the following snapshot of a system 8

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

Show that the system is in a safe state.

Unit IV

4.a. Explain the working of hashed page table. 6

4.b. Assume that for a certain processor, a read request takes 50 nanoseconds on a cache miss and 5 nanoseconds on a cache hit. Suppose while running a program, it was observed that 80% of the processors requests result in a cache hit. Calculate the average read access time. 6

4.c. Consider page reference string 5, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2. Assume that the system has 4 page frames that are empty initially. Find the number of page faults using Optimal Page replacement algorithm 8

OR

5.a. Define thrashing and explain why thrashing occurs 6

5.b. Given five memory partitions of 200 KB, 600 KB, 300 KB, 400 KB, and 700 KB (in order), illustrate how would best-fit algorithms place processes of 312 KB, 416 KB,640 KB, 224 KB, and 825 KB(in order). 6

5.c. A system uses 3 page frames for storing process pages in main memory. It uses the First in First out (FIFO) page replacement policy. Assume that all the page frames are initially empty. What is the total number of page faults that will occur while processing the page reference string 4, 7, 6, 1, 7, 6, 1, 2, 7, 2 8

Unit V

6.a. Justify how an Operating System allows multiple types of file systems to be integrated into a directory structure. 6

6.b. Consider a disk queue with requests for I/O to blocks on cylinders 8

98, 183, 37,122, 14, 124, 65, 67

If SSTF scheduling is used, determine the total head movement if the head is initially at 53.

6.c. Describe principle of least privilege. 6

OR

7.a. Explain how the boot loader loads a specific operating system. 6

7.b. Consider a disk queue with requests for I/O to blocks on cylinders 8

98,183,37,122,14,124,65,67

If FCFS scheduling is used, determine the total head movement if the head is initially at 41.

7.c. Explain the significance of access matrix. 6

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B. M. S. College of Engineering, Bengaluru - 560019

Autonomous Institute Affiliated to VTU

May / June 2019 Semester End Main Examinations

Programme: B.E. | **Semester : IV**
Branch : Computer Science And Engineering | **Duration: 3 hrs.**
Course Code: 15CS4DCOPS | **Max Marks: 100**
Course: Operating Systems | **Date: 01.06.2019**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may suitably assumed.

UNIT - I

1. a) Define Operating system. With a neat diagram, explain how operating system can be viewed as a Resource Manager. **07**

   b) Explain the working of Virtual machine with a neat diagram. Describe in detail the advantages and disadvantages of a Virtual machine. **07**

   c) Define System calls. Explain the different categories of System calls in brief. **06**

UNIT - II

2. a) Describe the different Multithreading models in brief. **04**

   b) Consider the following data with burst time given in milliseconds. **10**

Process	Burst time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

The processes are arrived in the order P1, P2, P3, P4, and P5 all at time 0.

i) Draw Gantt charts for the execution of these processes using FCFS, SJF, Non pre-emptive priority and RR (quantum=1) scheduling.

ii) What is the Turnaround time and Waiting time of each process for each of the scheduling algorithm?

   c) Explain the concept of Process. Also describe the contents of a Process Control Block (PCB). **06**

UNIT - III

3. a) Consider the following snapshot of a system. **10**

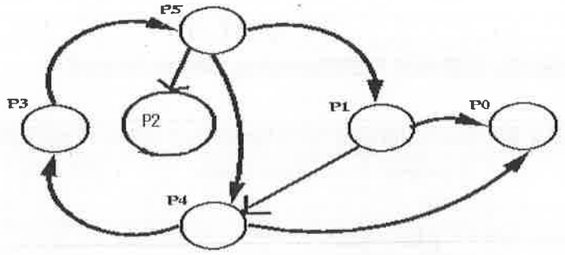
Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P1	0	0	1	2	0	0	1	2	1	5	2	0
P2	1	0	0	0	1	7	5	0				
P3	1	3	5	4	2	3	5	6				
P4	0	6	3	2	0	6	5	2				
P5	0	0	1	4	0	6	5	6				

Answer the following questions using Banker's algorithm.

i) What is the content of the Need matrix?
ii) Is the system in a safe state?
iii) If a request from process P1 arrives for (0, 4, 2, 0) can the request be granted immediately?

b) Define Semaphores. Explain Binary and Counting Semaphores with an example. **06**

c) For the given wait-for graph **04**
(i) Construct the resource allocation graph
(ii) Infer the sequence for deadlock, if present



UNIT - IV

4. a) Consider the following Page reference string: **09**
1,2,3,4,2,1,5,6,2,1,3,7,6,3,2,1,2,3,6. Find out the number of page faults if there are 4 page frames using the following page replacement algorithm.
i) LRU
ii) FIFO
iii) Optimal

b) Distinguish between **05**
i) Paging and segmentation
ii) First fit and Best fit algorithm

c) Describe the concept of Demand paging. Discuss the hardware support required for Demand paging. **06**

OR

5. a) Define Thrashing. Describe in detail the causes of Thrashing. **04**

b) Define page fault. Explain the steps involved in handling a page fault with a neat diagram. **06**

c) Mention the problem with the simple paging scheme. Analyze how TLB is used to solve this problem, explain with supporting hardware diagram. **10**

UNIT - V

6. a) Explain the different types of directory structures, with examples and mention their advantages and disadvantages. **07**

b) Describe linked and index method of allocating disk space with supporting diagrams. **07**

c) Explain access matrix method of system protection. **06**

OR

7. a) Assume the disk queue with request for I/O to block on cylinders as 80, 30,15,100,125,90,45 and 10. If the disk head is initially at cylinder 35, illustrate the disk movements using SSTF, FCFS and LOOK scheduling algorithm with relevant diagram and calculate the total head movement in terms of cylinders. **09**

b) Explain the various methods for free space management. **05**

c) Discuss virtual file system with a neat diagram. **06**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May 2018 Semester End Main Examinations

Course : Operating Systems
Course Code : 15CS4DCOPS

Duration: 3 hrs.
Max Marks: 100
Date: 24.05.2018

Instructions: Answer FIVE full questions, choosing one from each unit.

UNIT 1

1 a Define system call. Explain various types of system calls in detail. **10**

b Differentiate between android OS and Linux OS. **04**

c Specify the significance of virtual machines. **06**

UNIT 2

2 a Consider the following **12**

Process No	Burst time	Arrival time	Priority
P1	4	0	5
P2	6	0	3
P3	3	1	2
P4	7	2	4
P5	5	3	1

i. Calculate average turnaround time for FCFS and SJF (pre-emptive) and priority scheduling algorithm

ii. Identify whether round robin scheduling algorithm (with time quantum = 2) will reduce average turnaround time or not

Note: (priority 1 is highest and 5 is lowest)

b Elaborate on inter process communication considering client server computing as an example. **08**

UNIT 3

3 a Semaphore is used for process synchronization. Justify with an example. **08**

b Define deadlock. List the necessary conditions for occurrence of deadlock. Give at least two real world scenarios for deadlock occurrence. **12**

UNIT 4

4	a	Explain paging concept in a memory management with the structure of page table	08
	b	Is memory allocation always contiguous? Justify your answer with suitable examples.	06
	c	Segmentation increases efficient use of memory. Elaborate and illustrate how this is achieved.	06

OR

5	a	Apply FIFO and LRU page replacement algorithms and find page faults. Page frame size = 3. The page reference string is as below: 3,1,3,4,2,6,3,4,8,2,3,1,6,8,3,6	08
	b	Describe the working of Hashed page Table with a neat diagram.	06
	c	Define Thrashing. Justify that Working Set strategy prevents thrashing while keeping the degree of multiprogramming high.	06

UNIT 5

6	a	With a neat sketch, specify file system structure in detail.	08
	b	Explain the process of free space management.	06
	c	Illustrate with a neat diagram virtual file system implementation.	06

OR

7	a	Consider the drive having 5000 cylinders, numbered from 0 to 4999. The drive is currently serving a request at cylinder 143. The queue of pending requests is as follows (Assume the drive is moving towards zero) 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Find the number of head movements using the following disk scheduling algorithms. a) FCFS b) SSTF c) SCAN d) CSCAN	12
	b	Define access matrix. Show its implementation.	05
	c	List goals of protection.	03

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BMS College of Engineering, Bangalore-560019

(Autonomous Institute, Affiliated to VTU, Belgaum)

May 2016 Semester End Main Examinations

Course: OPERATING SYSTEM **Duration: 3 Hours**

Course Code: 15CS4DCOPS **Max Marks: 100**

Date: 11.05.2016

Instructions: Answer FIVE FULL questions, choosing one from each unit.

UNIT-1

1. a) Explain with a neat diagram the Operating System as a User/Computer Interface. Mention any three services of the Operating System. 07

   b) Explain the Virtual Memory concept and with a neat diagram explain the process and system virtual machines. 07

   c) Define system call. With a neat diagram explain the handling of a user application using open system call. 06

UNIT-2

2. a) Explain process state diagram and process control block 08

   b) Calculate average waiting time and average turnaround time for the following processes 12

Process	cpubursttime	priority
P1	2	2
P2	1	1
P3	8	4
P4	4	2
P5	5	3

Processes are arrived in the order p1,p2,p3,p4,p5 all at time 0.Draw Gantt chart and solve for the following scheduling types. i)Non-preemptive SJF ii)Priority(highest number has highest priority) iii)Roundrobin(Time quantum=2msec)

UNIT-3

3. a) Illustrate with an example the implementation of Semaphore that solves the problem of busy waiting. 05

   b) Discuss the methods used to handle deadlocks. Explain how circular wait condition can be prevented from occurring. 05

   c) Solve using Banker's algorithm considering the following snapshot of a system 10

Processes	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P_0	0	0	2	0	0	4	1	0	2
P_1	1	0	0	2	0	1			
P_2	1	3	5	1	3	7			
P_3	6	3	2	8	4	2			
P_4	1	4	3	1	5	7			

Answer the following:

i) Is the system in a safe state?
ii) If a request from process P2 arrives for (0,0,2) can the request be granted immediately?

UNIT-4

4. a) Differentiate between Logical and physical addresses .Illustrate the usage of stub in Dynamic Linking Process. 06
   b) With a neat diagram explain the mechanism of swapping of two process using disk as backing store. 06
   c) Explain how paging is supported by TLB with a neat diagram. Justify that the access time reduces using TLB . 08

OR

5. a) Explain the Implementation of second chance page replacement algorithm using circular queue**.** 06
   b) Consider the page Reference String 08
   7,2,3,1,2,5,3,4,6,7,7,1,0,5,4,6,2,3,0,1
   How many page faults would occur in the case of
   i)FIFO ii)LRU iii)Optimal Algorithm
   Assume 3 frames note that initially all frames are empty
   c) Illustrate copy on write concept in virtual memory with a neat diagram. 06

UNIT-5

6. a) Suppose that the disk drive has 5000 cylinders numbered from 0 to 4999. The drive is currently serving a request at cylinder 143 and the previous request was at cylinder 125. The queue of pending request in FIFO order is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from the current(location) head position calculate the total distance(in cylinders) that the disk arm moves to satisfy all pending requests for each of the following disk scheduling algorithms. 12
   1)FCFS 2) SSTF 3) C-SCAN 4)LOOK
   Illustrate with figures in each case.
   b) Describe the methods used for implementing the directories. 08

OR

7. a) Discuss with a neat diagram Linked file allocation. Justify that FAT is a linked Allocation. 08
   b) Describe in detail the access matrix model of implementing protection in operating systems. 08
   c) Illustrate that principle of least privilege is the guiding principle for protection. 04

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