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RAMAIAH
Institute of Technology

(Autonomous Institute, Affiliated to VTU)
(Approved by AICTE, New Delhi & Govt. of Karnataka)
Accredited by NBA & NAAC with 'A' Grade

SEMESTER END EXAMINATIONS JANUARY – FEBRUARY 2021

Program	:	**B.E. : Computer Science and Engineering**	**Semester**	:	**V**
Course Name	:	**Operating Systems**	**Max. Marks**	:	**100**
Course Code	:	**CS51**	**Duration**	:	**3 Hrs**

Instructions to the Candidates:

- Answer one full question from each unit.
- Draw figures wherever necessary.

UNIT- I

1. a) Discuss the features of Batch operating systems and Time shared operating systems. CO1 (06)
   b) List out and explain the services provided by the operating system. CO1 (08)
   c) Describe the Microkernel approach of structuring the operating system including its merits and demerits. CO1 (06)

2. a) List out the benefits of virtual machines and describe about para-virtualization. CO1 (06)
   b) With a diagram discuss how dual mode of operation protects operating system from errant users. CO1 (06)
   c) Define system call? Explain the different types of system calls under process management and memory management. CO1 (08)

UNIT – II

3. a) Provide the solution to the Producer Consumer problem using semaphores. CO2 (06)
   b) Illustrate direct and indirect communication using message passing. CO2 (06)
   c) Compute average waiting time and average turnaround time using Round Robin RR (Time slice=2ms) and shortest time to completion first (STCF) scheduling algorithms for the following system state. CO2 (08)

Process	Burst-Time (ms)	Arrival Time (ms)
P1	6	0
P2	4	1
P3	2	1
P4	4	2
P5	7	4

4. a) Illustrate a multilevel queue scheduling with a suitable diagram. CO2 (06)
   b) Explain a shared memory model of IPC using a suitable example. CO2 (06)
   c) Describe the readers-writer problem and its solution using semaphores. CO2 (08)

UNIT – III

5. a) Demonstrate the method of handling the page fault with a neat block diagram CO3 (06)

b) Consider the following snapshot of a system: CO3 (10)

Processes	Allocation			Max			Available		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	0	1	0	7	5	3	3	3	2
P2	2	0	0	3	2	2			
P3	3	0	2	9	0	2			
P4	2	1	1	2	2	2			
P5	0	0	2	4	3	2			

Solve the following using the banker's algorithm

i) What is the total number of instances of each type is available
ii) What is the content of the matrix need?
iii) Is the current allocation in a safe state?
iv) Can the request made by the process P1(4,5,0) be granted?

c) Consider the following segment table: CO3 (04)

Segment	Base	Length
0	219	600
1	2300	14
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?
i) 0,430 ii) 1,10 iii)3,400 iv) 4,112.

6. a) Given the process resource usage and availability, draw the resource-allocation graph and identify whether system is in deadlock state or not and justify your answer. CO3 (06)

Process	Current allocation			Outstanding requests			Available resources		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	2	0	0	1	1	0	0	0	0
P2	3	1	0	0	0	0			
P3	1	3	0	0	0	1			
P4	0	1	0	0	1	0			

b) Consider the following page reference string: CO3 (08)
5,7,6,0,7,1,7,2,0,1,7,1,0
How many page faults would occur for the following replacement algorithms assuming 3 frames
i) LRU replacement ii) FIFO replacement iii) Optimal replacement.

c) Justify the statement "thrashing affects the performance of a system". CO3 (06)

UNIT – IV

7. a) List and explain the several pieces of information that are associated with an open file. CO4 (06)

b) Differentiate between linear list and hast table implementations of a file directory. CO4 (05)

c) Suppose that a disk drive has 5000 cylinders, numbered 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 requests, in FIFO order, is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130
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? CO4 (09)

i. FCFS
ii. SSTF
iii. SCAN.

8.	a)	Explain indexed file allocation method with a neat figure.	CO4	(06)
	b)	Illustrate the file open and file read operations of in-memory file-system structures.	CO4	(06)
	c)	Explain tree structured and acyclic graph directories with examples.	CO4	(08)

UNIT – V

9.	a)	Illustrate with a diagram differences between container and virtual machine.	CO5	(06)
	b)	Show how a user can identify which network mode is being used by a container.	CO5	(06)
	c)	Describe the characteristics and use cases of volumes.	CO5	(08)
10.	a)	Explain why a docker needs a Union File System.	CO5	(06)
	b)	Describe the characteristics and use cases of bind mounts.	CO5	(08)
	c)	Illustrate basic workflow of the docker with a suitable diagram.	CO5	(06)

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