CY45/CI45

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RAMAIAH Institute of Technology

(Autonomous Institute, Affiliated to VTU)
(Approved by AICTE, New Delhi & Govt. of Karnataka)
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SEMESTER END EXAMINATIONS – AUGUST / SEPTEMBER 2023

Program	:	**B.E. – CSE (Cyber Security) / CSE (Artificial Intelligence and Machine Learning)**	**Semester**	: **IV**
Course Name	:	**Operating System**	**Max. Marks**	: **100**
Course Code	:	**CY45 / CI45**	**Duration**	: **3 Hrs**

Instructions to the Candidates:

- Answer one full question from each unit.

UNIT - I

1. a) With a neat diagram, describe the layered and modular approach for designing an operating system. CO1 (08)
   b) Differentiate between API and system calls. Explain system calls and their types. CO1 (07)
   c) Explain operating system from user and system perspective. CO1 (05)

2. a) List and explain the different services provided by operating system. CO1 (10)
   b) Differentiate between single and multiprocessor system stating the advantages of multiprocessor systems over single systems. CO1 (08)
   c) Describe the objective of multiprogramming and time sharing system. CO1 (02)

UNIT - II

3. a) Compare and contrast short term, long term and medium-term schedulers. CO3 (06)
   b) Consider the following set of processes with the length of the CPU burst given in milli seconds and are assumed to arrive at the time specified below: CO2 (08)

Processes	Arrival time(ms)	Burst time(ms)	Priority
P1	0	6	4
P2	3	5	2
P3	3	3	6
P4	9	5	3

   i. Draw two Gantt chart to illustrate the execution of the following processes using Round Robin (with time quantum= 2ms) and Preemptive priority (higher priority number indicates least priority) scheduling algorithms.
   ii. Calculate the waiting time of each of these processes using each of these scheduling algorithms.
   iii. Calculate the average waiting time for each of these scheduling algorithms.
   c) Describe Process control block stating the information stored in each field. CO3 (06)

4. a) Differentiate between a program and a process. Explain with neat diagram the context switching mechanism. CO3 (07)

   b) Describe different multi threading models with a neat diagram. CO3 (08)

   c) Consider the set of 3 processes whose arrival time and burst time are given in milli seconds as shown below: CO2 (05)

PID	ARRIVAL TIME (ms)	BURST TIME (ms)
P1	0	2
P2	3	1
P3	5	6

If the CPU scheduling policy is FCFS, calculate the average waiting time and average turnaround time.

UNIT - III

5. a) What is meant by critical section problem? Give its structure. Explain the requirements that must be satisfied by solution to the critical section problem. CO3 (10)

   b) Briefly describe semaphore based solution to solve Dining Philosopher's problem. CO3 (10)

6. a) Consider the following snap shot of a system: CO3 (10)

Process	Allocation			Max		
	A	B	C	A	B	C
P0	0	1	0	7	5	3
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

The avail vector as (3, 3, 2). Use Banker's algorithm and answer:
What is the content of the matrix NEED?
Is the system in SAFE state? If so give the sequence.
If a request from process P4 arrives for (3, 3, 0) can the request be granted immediately?

   b) Describe the different approaches for recovering from deadlock. CO3 (10)

UNIT- IV

7. a) Memory access to a byte involving paging technique will consume more time. Justify how this can be addressed using TLB's. CO5 (07)

   b) Define thrashing. What is the cause of thrashing? Discuss how page fault frequency technique can be used to solve Thrashing. CO5 (05)

   c) Consider a main memory with five-page frames and the following sequence of page references: 3, 8, 2, 3, 9, 1, 6, 3, 8, 9, 3, 6, 2, 1,3. CO2 (08)

   How many page faults would occur for the following replacement algorithms? All frames are initially empty,

   i. FIFO replacement.

   ii. LRU replacement.

8.	a)	Discuss Belady's anamoly. Illustrate with an example. Explain an algorithm that does not suffer from Belady's anamoly.	CO2	(08)
	b)	Describe different steps involved in handling a page fault.	CO5	(05)
	c)	Differentiate between internal and external fragmentation. Describe segmentation technique with a neat diagram.	CO5	(07)

UNIT - V

9.	a)	Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The FCFS scheduling algorithm is used. The head is initially at cylinder number 53. The cylinders are numbered from 0 to 199. Calculate the total head movement (in number of cylinders) incurred while servicing these requests.	CO5	(10)
	b)	Explain the following with an example: i. Seek time ii. Rotational latency iii. Data transfer rate iv. Controller overhead v. Queuing delay.	CO5	(10)
10.	a)	Consider a disk queue with requests for I/O to blocks on cylinders 47, 38, 121, 191, 87, 11, 92, 10. The LOOK scheduling algorithm is used. The head is initially at cylinder number 63 moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. Calculate the total head movement (in number of cylinders) incurred while servicing these requests.	CO5	(10)
	b)	Explain various allocation methods in implementing file systems.	CO5	(10)

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