KUMARAGURU
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MCA DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2020)

First Semester

MASTER OF COMPUTER APPLICATIONS

P20CAT1103: Advanced Operating Systems

COURSE OUTCOMES

CO1:   Know the basics concepts of operating systems

CO2:   Understand process management, synchronization and deadlock concepts.

CO3:   Analyze various memory management techniques and disk scheduling algorithms.

CO4:   Demonstrate file system, Allocation Methods and Free space management.

CO5:   Understand Virtualization.

CO6:   Compare iOS and Android mobile operating System

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions

PART A (10 x 1 = 10 Marks)

1.   Which one of the following is not true?   CO1   [K1]

   a)   Kernel is the program that constitutes the central core of the operating system

   b)   Kernel is the first part of operating system to load into memory during booting

   c)   Kernel is made of various modules which can not be loaded in running operating system

   d)   Kernel remains in the memory during the entire computer session

2.   Assertion (A): A bootstrap program is the first code that is executed when the computer system is started.   CO1   [K3]
Reason (R): The operating system is loaded into the RAM by the bootstrap program after the start of the computer system.

   a)   Both A and R are correct and R is the correct explanation for Statement A

   b)   Both A and R are correct but R is not the correct explanation for Statement A

   c)   A is correct but R is incorrect

   d)   A is incorrect but R is correct

3.   Round-Robin scheduling is _____.   CO2   [K2]

   a)   Preemptive Scheduling

   b)   Fair share scheduling

   c)   Deadline Scheduling

   d)   Non-Preemptive Scheduling

4. Match list I with list II and select the correct answer using the codes given below   CO2   [K3]

List I	List II
1. Critical section	a. Deadlock
2. Swap in and swap out	b. Semaphore
3. Starvation	c. Process creation
4. fork()	d. Medium-term scheduler

a)   1-c,2-a,3-d,4-b   b)   1-d,2-c,3-a,4-b

c)   1-b,2-d,3-a,4-c   d)   1-b,2-c,3-a,4-d

5. Assertion (A) : The problem of indefinite blockage of low – priority processes can be rectified .   CO2   [K3]
Reason (R) : Aging is a technique which helps to increase the priority of process when indefinite blockage of process occurs.

a)   Both A and R are correct and R is the correct explanation for Statement A   b)   Both A and R are correct but R is not the correct explanation for Statement A

c)   A is correct but R is incorrect   d)   A is incorrect but R is correct

6. Rearrange the hierarchy of multilevel queue scheduling – High to low   CO2   [K4]
i. Batch processes
ii. System processes
iii. Student processes
iv. Interactive editing processes
v. Interactive processes

a)   ii-v-iv-i-iii   b)   ii-v-i-iv-iii

c)   iv-iii-ii-v-i   d)   i-ii-iii-iv-v

7. A page faults occurs when _____   CO3   [K2]

a)   the segmentation starts   b)   the page is not found in the main memory

c)   the deadlock happens   d)   the page found in the memory

8. Rearrange the order of basic page replacement steps :   CO4   [K2]
i) Bring the desired page into the free frame.
ii) Continue the process by restarting the instruction that caused the trap.
iii) Find the location of the desired page on disk.
iv) Update the page and frame tables
v) Find a free frame

a)   ii-iv-i-v-iii   b)   iii-v-i-iv-ii

c)   iv-iii-ii-v-i   d)   i-ii-iii-iv-v

9. In which language Microsoft's Windows kernel is developed?   CO6   [K2]
a)   Java   b)   C
c)   Fortran   d)   Python

10. _____is a multi user, multi tasking system with a full set of UNIX-   CO6   [K1]

compatible tools.

a)   Windows   b)   Disk Operating System

c)   IoS   d)   Linux

PART B (10 x 2 = 20 Marks)
Answer all the Questions

11.	What are Operating Systems services?	CO1	[K_1]
12.	Give the difference between multiprogramming and timesharing systems.	CO1	[K_2]
13.	Draw the state diagram of a process.	CO2	[K_2]
14.	Compare long-term scheduler and short-term scheduler.	CO2	[K_2]
15.	What is a wait-for-graph in deadlock?	CO2	[K_1]
16.	List the methods to overcome the external fragmentation in memory management.	CO3	[K_2]
17.	What are the advantages of virtual memory?	CO3	[K_3]
18.	When does system go to a thrashing state?	CO3	[K_2]
19.	Define seek time.	CO4	[K_1]
20.	List out the mobile operating systems available in the market.	CO6	[K_3]

PART C (10 x 5 = 50 Marks)
Answer all the Questions

21. What are the five major activities of an operating system in regard to process management?   CO1 [K_2]

22. Write a short note on multi-threading models in operating systems.   CO1 [K_2]

23. Discuss about what semaphores are, their usage, and implementation given to avoid busy waiting using binary semaphores.   CO2 [K_3]

24. What are the models of Inter Process Communication (IPC) paradigms?   CO2 [K_3]

25. Consider the following page reference string: CO3 [K_5]

7,0,1,2,0,3,0,4,2,3,0,3,0,3,2,1,2,0,1,7,0,1

How many page faults would occur for the following replacement algorithms, assuming there are three frames? Remember all frames are initially empty, so your first unique pages will all cost one fault each.

• LRU replacement

• FIFO replacement

Which page replacement algorithm is best, why?

26. Given five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in order), how would each of the first-fit, best-fit, and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order)? Which algorithm makes the most efficient use of memory?   CO3 [K_4]

27. Elaborate the concept of paging with a suitable diagram.   CO3 [K_2]

28. Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 100, The queue of pending requests in FIFO order, is 23, 89, 132, 42, 187 .With disk head initially at 100 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 FCFS, SSTF, SCAN, C-SCAN disk-scheduling algorithms? Illustrate each case with figures.   CO4 [K_5]

29.	Write short note on file system interface.	CO4	[K$_3$]
30.	Discuss about the challenges while developing the new operating systems.	CO6	[K$_2$]

PART D (2 x 10 = 20 Marks)
Answer any TWO Questions

31. Consider the following set of processes, with the length of the CPU burst time given in milliseconds   CO2   [K$_4$]

Process	Burst Time	Priority
P1	9	3
P2	6	1
P3	1	2
P4	9	4
P5	3	5

Solve the given problem using FCFS, SJF, Priority scheduling and Round robin (TQ= 1 ms)

  a) Draw Gantt chart   4
  b) Calculate waiting time, turnaround time of each process.   4
  c) Calculate average waiting time and average turnaround time.   2

32. Consider the snapshot of a system ,

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	2	0	1	2	3	0	1	2	1	4	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				

CO3   [K$_5$]

Using Banker's algorithm, answer the following questions.
(a) How many instances of each type resources A, B, C, and D are there?
(b) Identify the need matrix of resource instances.
(c) After the request of instances for P2 (1 0 2 3) , Is the system in safe state?

33. Elaborate the concept of Virtualization and its applications   CO5   [K$_3$]

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