MCA DEGREE EXAMINATIONS: DEC 2022

(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. Assertion (A): A bootstrap program is the first code that is executed when the computer system is started.   CO1   [K1]
   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

2. 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

3. First Come First Serve (FCFS) 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. Loader	a. Process state
2. Process	b. System software
3. Running	c. Identify and Remove errors
4. Debug	d. Active entity

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

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

5. Assertion (A): The problem of indefinite blockage of low – priority processes can be   CO2   [K3]
rectified.
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   b)   Both A and R are correct but R is not
          correct explanation for Statement A   the correct explanation for Statement A

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

6. The data structures available in the Banker's algorithm are: (choose all that apply)   CO2   [K4]
     i.   Available
     ii.   Need
     iii. Allocation
     iv. Maximum
     v.   Minimum

     a)   i only   b)   i & iii only

     c)   i,ii & iv only   d)   i,ii,iii& iv only

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. Free space management is accomplished using _____ CO4 [K1]
   a) Hash Tables b) Indexed allocation
   c) Contiguous allocation d) Bit vector

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

11. What are system calls and services in Operating Systems? CO1 [K1]
12. What is the main advantage of timesharing operating system? CO1 [K2]
13. Draw the state diagram of a process. CO2 [K2]
14. Give the difference between long-term scheduler and short-term scheduler. CO2 [K2]
15. Is it possible to have a deadlock involving only one process? Justify your answer. CO3 [K1]
16. What is storage compaction? CO3 [K2]
17. Compare internal and external fragmentation. CO3 [K3]
18. When does system go to a thrashing state? CO3 [K2]
19. Define seek time. CO4 [K1]
20. What is swift? Where is it used? CO6 [K3]

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 [K2]
22. Write a short note on threads in operating systems. CO1 [K2]
23. Discuss about what semaphores are, their usage, and implementation given to avoid busy waiting using binary semaphores. CO2 [K3]
24. What are the models of Inter Process Communication (IPC) paradigms? CO3 [K3]
25. Consider the snapshot of a system, CO3 [K5]

	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				

Using Banker's algorithm, answer the following questions.
(a) How many instances of each type resources A, B, C, and D are there?
(b) Is the system in a safe state?

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? CO4 [K4]

27. Elaborate the concept of paging with a suitable diagram. CO4 [K2]

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   [K5]

29. Explain the concept of contiguous allocation method of disk block with a neat diagram in detail.   CO4   [K3]

30. Discuss about various mobile operating systems available in the market.   CO6   [K2]

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   [K4]

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

32. Consider the following page reference string: CO4   [K5]
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   3
• FIFO replacement   3
• Optimal replacement   3
Which page replacement algorithm is best, why?   1

33. Elaborate the concept of Virtualization and its applications   CO5   [K3]

****