

Final Assessment Test – July 2023



VIT
Vellore Institute of Technology
(Established in the year 1984 and started operations in 1985)

Course: BCSE303L - Operating Systems

Class NBR(s): 0689/0692/0694/0696/0703/0708/0711/
0714/0717/0720/0728/0731/0745/0748/0752/0754/
0761/0765/0769/0775/0777/0780/0784/0787/0945/
1375

Slot: B1+TB1

Time: Three Hours

Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE

Answer ALL Questions

(10 X 10 = 100 Marks)

1. a) Enumerate the different operating system structure and explain with neat sketch. [8]
b) Discuss the need for dual mode operations in Operating System. [2]
2. a) Define system call and system programs and list its categories respectively. [5]
b) Write the difference between user level thread and kernel level thread? [5]
3. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:

Process	Arrival Time(ms)	Burst Time(ms)	Priority
P1	0	7	3
P2	2	4	1
P3	3	2	5
P4	4	4	4
P5	5	5	2

Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non-preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 2) scheduling. Calculate Average Waiting time and Average turnaround time.

4. Consider the following system snapshot using data structures in the Banker's algorithm, with resources A, B, C and process P0 to P4.

Process	Allocation			Max			Availability			Need		
	A	B	C	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						

Using banker's algorithm, Answer the following questions:

- a) How many resources of type A, B, and C are there?
- b) What are the contents of the need matrix?
- c) Find the safe sequence if any.
- d) If an additional resource request is given by P4 as (1 1 1), will it be granted or not?

5. a) Solution to critical section problem should satisfy i. Mutual Exclusion. ii. Progress and iii. bounded waiting. An attempt to solve the CS problem is listed below for two processes. Explain which of the above mentioned conditions satisfy for the provided solution. (Hint : Both Process P0 and P1 executes concurrently.)

Solution:

Initial Values $\rightarrow$ flag [0]=F, flag [1]=F.

P0	P1
<pre>While(1) {flag[0]=T; while(flag[1]); critical section; Flag[1]=F; }</pre>	<pre>While(1) {flag[1]=T; while(flag[0]); critical section; Flag[0]=F; }</pre>

- b) The following program consists of 3 concurrent processes and 3 binary semaphores. The semaphores are initialized as S0=1, S1=0, S2=0. Comment on the number of times "print 0" will get executed with appropriate explanation.

Process P0	Process P1	Process P2
<pre>while (true) { wait (S0); print (0); signal (S1); signal (S2); }</pre>	<pre>wait (S1); signal (S0);</pre>	<pre>wait (S2); signal (S0);</pre>

6. Discuss in detail the critical section problem and also write the algorithm for Readers-Writers Problem with semaphores.
7. a) Consider a single-level page table system, with the page table stored in the memory. If the hit rate to TLB is 75%, and it takes 15 nanoseconds to search the TLB, and 150 nanoseconds to access the main memory, then what is the effective memory access time, in nanoseconds? [5]
- b) Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order)? Which algorithm makes the most efficient use of memory? [5]
8. Determine the number of page faults using FIFO, Optimal, LRU algorithms, when references to pages occur in the order

1 2 3 4 2 1 5 6 2 1 2 3 7

Assume that the main memory can accommodate 4 pages. Remember that all frames are initially empty, so your first unique pages will all cost one fault each.

9. a) Compare and contrast the following hypervisors: Xen, KVM, Oracle VM and VMWare ESXi, based on the support provide by the mentioned hypervisors as provided in the table. [5]

Support for:	Xen	KMV	Oracle VM	VMWare Esxi
Para-virtualization				
Full virtualization				
Host CPU				
Guest CPU				
Host OS				
Guest OS				
VT-x/AMD-v				
Live Migration				
License				

- b) Explain the file allocation methods. [5]

10. Consider a disk with 200 tracks and the queue has random requests from different processes in the order: 87, 170, 40, 150, 36, 72, 66, and 15. Initially arm is at 60. Find the total Seek length using FIFO, SSTF, SCAN and LOOK algorithm (for SCAN and LOOK, arm movement towards outer track).

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