

Reg. No.														
----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B.Tech. DEGREE EXAMINATION, DECEMBER 2023
Fourth Semester

18CSC205J – OPERATING SYSTEMS

(For the candidates admitted from the academic year 2020-2021 & 2021-2022)

Note:

- (i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
- (ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Marks BL CO PO

Answer ALL Questions

- In the process of synchronization, when the sender is blocked until the receiver receives the message is called _____.
(A) Non-blocking send (B) Blocking send
(C) Blocking receive (D) Non-blocking receive
- A process is called as a _____ process when its parents get terminated without invoking wait () system call to get its status.
(A) Orphan (B) Zombie
(C) System (D) Interactive
- A process's memory space can be replaced with a new program by calling the _____ system call after fork () system call
(A) Wait () (B) Replace ()
(C) Override () (D) Exce ()
- In the simple batch systems, the execution of jobs are controlled by _____.
(A) Monitors (B) Kernel
(C) Init process (D) Bios
- The preemptive version of shortest job first scheduling algorithm is called as _____ algorithm.
(A) Shortest execution time first (B) Shortest waiting time first
(C) Shortest remaining time first (D) Shortest burst time first
- The Peterson's solution for critical section problem is applicable for only _____ processes.
(A) Four (B) Six
(C) Three (D) Two
- The mutex lock with busy waiting is called as _____.
(A) Spin lock (B) Busy lock
(C) Continuous lock (D) Dead lock

8. Which of the following is not a necessary condition for a dead lock to occur? 1 2 2 2
 (A) Circular wait (B) Preemption
 (C) Hold and wait (D) Mutual exclusion
9. The absolute code is generated at _____ time. 1 1 3 1
 (A) Load (B) Execution
 (C) Compile (D) Waiting
10. The cache of page table for fast-lookup is called as _____. 1 1 3 1
 (A) Translation look aside buffer (B) Transition look aside buffer
 (C) Transformation look aside buffer (D) Transaction look aside buffer
11. Compaction is a solution for the problem called _____. 1 2 3 1
 (A) Internal fragmentation (B) External fragmentation
 (C) Overall fragmentation (D) Page level fragmentation
12. When the content of the base register and limit register are 310050 and 140150, then which are all the legal addresses that can be produced by the CPU? 1 3 3 2
 (A) 452000 (B) 410119
 (C) 420223 (D) 310048
13. When a process tries to access a page which is not currently existing in the main memory is called _____. 1 1 4 1
 (A) TLB miss (B) Page hit
 (C) Page fault (D) TLB hit
14. The _____ with high speed is called as "Swap Device" to support demand paging. 1 1 4 1
 (A) Secondary memory (B) Primary memory
 (C) Virtual memory (D) Main memory
15. For the given reference string, calculate the number of page faults using FIFO (with three free frames) 1, 2, 3, 4, 3, 1 1 3 4 2
 (A) 3 (B) 4
 (C) 5 (D) 6
16. _____ model is one of the technique which can be used to avoid thrashing. 1 2 4 2
 (A) Working page (B) Working frame
 (C) Working group (D) Working set
17. _____ is the method which is used to handle the bad blocks. 1 2 5 1
 (A) Sector sparing (B) Sector repairing
 (C) Sector cleaning (D) Sector washing
18. Which of the following is not a file access methods? 1 2 5 1
 (A) Sequential (B) Direct
 (C) Hashed (D) Indirect

- | | |
|--|------------------------|
| 19. In a two-level directory structure, UFD stands for _____. | 1 1 5 1 |
| (A) Unique file directory (B) User files directory | |
| (C) Unified file directory (D) Universal file directory | |
| | |
| 20. The smallest unit of transfer in disk structure is called as _____. | 1 1 5 1 |
| (A) Physical blocks (B) Logical blocks | |
| (C) Main memory blocks (D) Secondary memory blocks | |

PART – B (5 × 4 = 20 Marks)

Answer **ANY FIVE** Questions

- | | |
|---|------------------------|
| 21. Long term, short term and medium term scheduler are three different schedulers. Draw and explain the state diagram of a process and brief where and how these schedulers are used for the process transition from one state to another. | 4 2 1 3 |
| | |
| 22. Write and explain the algorithm for test-set-lock with bounded waiting for process synchronization. | 4 2 2 2 |
| | |
| 23. Consider a paging system with page table stored in the memory and a fast-lookup cache for page table TLB is also used. Calculate the effective memory access time for the following inputs. TLB hit ratio-80%, time taken for a single memory reference is 100 nanoseconds. | 4 3 3 2 |
| | |
| 24. Diagrammatically represent the dynamic relocation of address (from logical to physical address) using relocation register and find the physical address for the following logical address. (Note: the content of relocation register is 15500). (i) 154 (ii) 453 | 4 3 3 2 |
| | |
| 25. Consider a scenario, where the frame size is 2 kB. The total free frames available are 75 in numbers. There are 3 processes each with the size (in frames) 20, 40 and 60 respectively are to be allotted with the available free frames. Calculate the number of frame that can be allotted to each process using “Equal allocation” and “proportion allocation” methods. | 4 3 4 2 |
| | |
| 26. The effective access time is directly proportional to the page fault rate. Justify with suitable example. | 4 4 4 2 |
| | |
| 27. Define protection access control. Interpret the following file permission and specify the permission for each class of users over the file.
-rwx -r - - - rw -
Write the various commands which are used to change the file permission. | 4 3 5 2 |

PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

- | | |
|--|-------------------------|
| 28. a. Draw and explain in detail about the different types of pipes with suitable diagrams. | 12 2 1 1 |
|--|-------------------------|

(OR)

- b. Consider the following scenario. The size of the main memory is 30,000 words. The size of the operating system is 4000 words. It occupies the main memory from 0 to 3999. The time slice is 05 secs for time sharing system (CTSS). The user program can accommodate the memory from 4000 to 29,999. Consider the following jobs (with their sizes) arrived at the same time and gets the CPU in turns, like job 1 will be executed for first 5 sec, the job 2 for next 5 secs and continue till job 5. If the processes could not able to complete its execution within 5 secs, it has to wait for its second turn.

Draw and explain the state of the memory when each job get its first turn for its execution and also suggest the best options to take decision on retaining and swapping the processes to and from the memory for the reduced number of swapping (program) from main memory to secondary memory and vice versa.

Job 1 – 12,000 words

Job 2 – 8,000 words

Job 3 – 20,000 words

Job 4 – 4,000 words

Job 5 – 15,000 words

29. a. Consider the two processes P_1 and P_2 are periodic in nature, whose periods are $P_1 = 35$ and $P_2 = 50$ with fixed processing time $t_1 = 20$ and $t_2 = 25$ respectively. Schedule these processes P_1 and P_2 using rate-monotonic scheduling algorithm and illustrate your answer using the Gantt chart and check whether the processes meet their deadline perfectly or not.

If not, schedule the processes using earliest deadline first scheduling algorithm and justify your answer with the help of Gantt chart.

(OR)

- b. Consider the following scenario

	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P_0	2	1	1	5	2	2	2	2	0
P_1	2	2	2	4	3	4			
P_2	1	0	3	3	2	5			
P_3	2	3	4	3	4	4			
P_4	1	1	1	5	4	5			

P_0, P_1, P_2, P_3 and P_4 are processes and A, B and C are resources.

Using Banker's algorithm

- Ensure that the system is in safe state and suggest the order in which the processes can complete their execution in safe mode
- Assume if a process P_4 raises a request (2, 1, 0), can the request be granted immediately
- If yes, will this affect the processes order for safe state? Justify the same with your answer.

30. a.i. Draw the structure of the paging hardware.

- ii. Consider the following scenario logical memory.

Page 0					Page 1					Page 2				
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o

Page 3					Page 4					
15	16	17	18	19	20	21	22	23	24	25
p	q	r	s	t	u	v	w	x	y	z

Page table	Page no:	0	1	2	3	4
	Frame no:	9	8	12	1	5

- (1) Draw the structure of the physical memory for this scenario.
- (2) Calculate the physical address for the following input data
g, q, b, v, e

5
4

(OR)

- b. Given six memory partitions of 200 kb, 300 kb, 500 kb, 550 kb, 400 kb and 600 kb (in order). How would the first-fit, best-fit and worst-fit algorithms place processes of 235 kb, 540 kb, 145 kb and 560 kb (in order)? Which algorithm results with effective memory usage? Justify your answer.

12 4 3 2

31. a. Calculate the number of page faults occurs for the following input reference string using least-recently used page replacement algorithm with four (page) free frames.

12 3 4 2

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

Does FIFO page replacement algorithm result with better page faults when compared to LRU for this particular reference string? Justify your answer.

(OR)

- b. Explain in detail about working set model and discuss how it avoids thrashing with suitable examples.

12 2 4 2

32. a.i. Define the terms

3 2 5 1

- (1) Seek time
- (2) Transfer time
- (3) Disk-access time

- ii. Calculate the average disk access time for transferring 4 kB of data block on a 8400 RPM disk with the following inputs

9 3 5 1

Average seek time = 10 ms

Transfer rate = 2 GB/sec

Controller overhead = 0.2 ms

(OR)

- b. Consider that a disk drive has 500 cylinders numbered from 0 to 499. The current head position is at 199. Calculate the total number of head movements required to service the following requests using FCFS and shortest seek-time first. Which algorithm will suit best for this given requests? Justify your answer.

12 3 5 1

Requests → 145, 243, 99, 121, 124, 64, 68, 100

* * * * *

