

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**BSc DEGREE EXAMINATION DECEMBER 2024
(Third Semester)**

Branch - **COMPUTER SCIENCE**

OPERATING SYSTEMS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Which of the following refers to the associative memory? A. the address of the data is generated by the CPU B. the address of the data is supplied by the users C. there is no need for an address i.e. the data is used as an address D. the data are accessed sequentially	K1	CO1
	2	To avoid the race condition, the number of processes that may be simultaneously inside their critical section is A. 8 B. 1 C. 16 D. 0	K2	CO2
2	3	The Memory Buffer Register (MBR) A. is a hardware memory device which denotes the location of the current instruction being executed. B. is a group of electrical circuits (hardware), that performs the intent of instructions fetched from memory. C. contains the address of the memory location that is to be read from or stored into. D. contains a copy of the designated memory location specified by the MAR after a "read" or the new contents of the memory prior to a "write".	K1	CO1
	4	The strategy of allowing processes that are logically runnable to be temporarily suspended is called A. preemptive scheduling B. non preemptive scheduling C. shortest job first D. first come first served	K2	CO2
3	5	The LRU algorithm A. pages out pages that have been used recently B. pages out pages that have not been used recently C. pages out pages that have been least used recently D. pages out the first page in a given area	K1	CO1
	6	Fork is A. the dispatching of a task B. the creation of a new job C. the creation of a new process D. increasing the priority of a task	K2	CO2
4	7	Thrashing A. is a natural consequence of virtual memory systems B. can always be avoided by swapping C. always occurs on large computers D. can be caused by poor paging algorithms	K1	CO1
	8	Interprocess communication A. is required for all processes B. is usually done via disk drives C. is never necessary, D. allows processes to synchronize activity	K2	CO2

Cont...

5	9	The FIFO algorithm A. executes first the job that last entered the queue B. executes first the job that first entered the queue C. execute first the job that has been in the queue the longest D. executes first the job with the least processor needs	K1	CO1
	10	In virtual memory systems, Dynamic address translation A. is the hardware necessary to implement paging B. stores pages at a specific location on disk C. is useless when swapping is used D. is part of the operating system paging algorithm	K2	CO2

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Trace the process creation flow in the form of tree structure and illustrate the output : (10) If(fork() && fork()) fork() { fork(); printf("1"); printf("2");	K3	CO3
		(OR)		
	11.b.	Investigate the existence of orphan, daemon and zombie process in process management.		
	12.a.	IPC using Choose an appropriate IPC mechanism and explain to implement the following scenario: Faculty process assigns lab question no for each student and this assignment is to be maintained confidential w.r.t student process. Student roll no: 1 to 60 Question no: 1 to 4 (assigned at random) Student process should feed the student roll no and get the relevant question no. Every student should be allowed to get their respective question no alone. They cannot check the question no for another student. Justify your answer.	K3	CO3
		(OR)		
	12.b.	Consider a non negative semaphore S. 20P(S) and 14 V(S)operations are performed on S in some order, where P(S) decrements S and V(S) increments. Estimate the largest initial value of S that will keep at least one process blocked.		
3	13.a.	Page replacement Policy - Implement a Suitable page replacement policy in memory management for the following scenario: System supports 3 page frames in main memory. It selects the page which came to memory early. Assume that all the page frames are initially empty. Display number of hits, page fault, hit ratio and miss ratio for the given working set 4, 7, 6, 1, 7, 6, 1, 2, 7, 2.	K4	CO4
		(OR)		
	13.b.	Consider a system having m resources of the same type. These resources are shared by 3 processes A, B and C which have peak demands of 3, 4 and 6 respectively. For what value of m, deadlock will not occur?		

Cont...

4	14.a.	Disk scheduling Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. Implement appropriate disk scheduling algorithm that moves the head cylinder number 53 and move towards the other end servicing all the requests in between. After reaching the other end, head reverses its direction and move towards the starting end servicing all the requests in between The same process repeats.		
	(OR)			
	14.b.	Enumerate about I/O Systems.		
5	15.a.	Sketch the structure of Direct Memory Access in detail.	K2	CO2
	(OR)			
	15.b.	Provide a pseudocode or code snippet for Peterson's solution for two processes. Describe how this solution satisfies the synchronization criteria . Additionally, discuss the approach to extending Peterson's solution to handle multiple processes.		

SECTION -C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks

(3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO																																																																	
1	16	Design an appropriate scheduling policy that can suit to the following scenario. All the three processes P1,P2,P3 arrived at 0 th time instant with total execution time(ET) of 10,15,20 ms respectively. First 20% of ET spent for I/O then 60% of ET for CPU processing and last 20% of ET again for I/O. The policy should address the convoy effect and should give fair chance to all the process for fixed time slice of 5 units and should be repeated till completion. Estimate the average (response time) RT, TAT, WT and CPU utilization percentage.	K4	CO1																																																																	
2	17	Develop the structure of the reader and writer process to achieve synchronization between multiple readers and writers. Mention the challenge posed on writers by allowing concurrent readers and how it can be resolved.	K4	CO1																																																																	
3	18	Explain various types of system calls with an example for each.	K4	CO1																																																																	
4	19	A system has 4 processes named as A,B,C,D and 5 allocatable resources. R1,R2,R3,R4,R5. The current allocation and maximum needs are as follows- Refer to table below If Available = [0 0 X 1 1], what is the smallest value of x for which this is a safe state and mention the safe sequence. <table><thead><tr><th rowspan="2">Process</th><th colspan="5">Allocated</th><th colspan="5">Maximum</th></tr><tr><th>R1</th><th>R2</th><th>R3</th><th>R4</th><th>R5</th><th>R1</th><th>R2</th><th>R3</th><th>R4</th><th>R5</th></tr></thead><tbody><tr><td>A</td><td>1</td><td>0</td><td>2</td><td>1</td><td>1</td><td>1</td><td>1</td><td>2</td><td>1</td><td>3</td></tr><tr><td>B</td><td>2</td><td>0</td><td>1</td><td>1</td><td>0</td><td>2</td><td>2</td><td>2</td><td>1</td><td>0</td></tr><tr><td>C</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>2</td><td>1</td><td>3</td><td>1</td><td>1</td></tr><tr><td>D</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>2</td><td>2</td><td>0</td></tr></tbody></table>	Process	Allocated					Maximum					R1	R2	R3	R4	R5	R1	R2	R3	R4	R5	A	1	0	2	1	1	1	1	2	1	3	B	2	0	1	1	0	2	2	2	1	0	C	1	1	0	1	1	2	1	3	1	1	D	1	1	1	1	0	1	1	2	2	0	K4	CO1
Process	Allocated					Maximum																																																															
	R1	R2	R3	R4	R5	R1	R2	R3	R4	R5																																																											
A	1	0	2	1	1	1	1	2	1	3																																																											
B	2	0	1	1	0	2	2	2	1	0																																																											
C	1	1	0	1	1	2	1	3	1	1																																																											
D	1	1	1	1	0	1	1	2	2	0																																																											
5	20	Explain interrupts in detail.	K4	CO1																																																																	

Z-Z-Z

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