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AY 25

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

M.C.A. (First Semester - Regular) Examinations, January – 2026

MCA251002 – Operating Systems
(MCA)

Time: 3 hrs | Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. What is an operating system? Define a multiprogrammed operating system.	CO1	K1
b. What is a Process Control Block (PCB)?	CO2	K2
c. What is a semaphore?	CO3	K2
d. Differentiate between logical and physical address space.	CO4	K2
e. Define directory structure in a file system.	CO5	K2

PART – B **(10 x5=50 Marks)**

Answer ***ALL*** questions	Marks	CO #	Blooms Level
2. a. Define an operating system. Explain its main operations and functions with suitable examples.	5	CO1	K2
b. Explain distributed systems. How do they differ from traditional operating systems?	5	CO1	K1
(OR)			
c. Consider a set of three processes, P1, P2 and P3 with their CPU burst times in milliseconds. Assume time quantum q=2 ms. Find average waiting time using Round Robin Scheduling.	5	CO1	K2
d. Discuss the scheduling criteria in CPU scheduling. Why are they important?	5	CO1	K2
3.a. Explain process synchronization in operating systems. Discuss the role of shared memory and message passing in process communication.	5	CO2	K2
b. Define deadlock. Explain the system model and the four necessary conditions for the occurrence of deadlocks.	5	CO2	K2
(OR)			
c. What is a race condition? Explain the critical section problem and the conditions required to solve it.	5	CO2	K2
d. Consider the following snapshot of a system:	5	CO2	K4

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				

Process	CPU burst time
P1	10
P2	5
P3	2

Answer the following questions using Banker's algorithm

P3	0	6	3	2	0	6	5	2	
P4	0	0	1	4	0	6	5	6	

(i) Is the system in a safe state?

(ii) If a request from process P1 arrives for(0, 4, 2, 0). Can the request be granted immediately?

4.a.	Describe how address mapping is carried out using the Memory Management Unit (MMU) with a neat diagram.	5	CO3	K3
b.	Describe the structure of page tables and explain how logical addresses are translated into physical addresses.	5	CO3	K2
	(OR)			
c.	Discuss the advantages and limitations of paging and segmentation in modern operating systems. Explain why most modern OS use a combination of both.	10	CO3	K4
5.a.	Explain different file access methods. Describe sequential access, direct access, and indexed access with suitable examples.	5	CO4	K2
b.	Explain efficiency and performance issues in file system implementation. Discuss how caching, buffering, and disk scheduling improve file system performance.	5	CO4	K2
	(OR)			
c.	Given the page reference sequence: 2, 3, 5, 4, 3, 2, 1, 5, 6, 2, 4, 3, 1, 6, 5, 2, 3, 4. Calculate the total number of page faults using the LRU page replacement algorithm with 3 frames. Explain each replacement decision.	10	CO4	K4
6.a.	Explain disk scheduling algorithms. Describe FCFS with their advantages and disadvantages.	5	CO5	K2
b.	Explain RAID architecture. Describe different RAID levels and their advantages.	5	CO5	K3
	(OR)			
c.	Explain applications of I/O interfaces. Discuss the use of I/O interfaces in storage devices, networking, multimedia, and real-time systems.	5	CO5	K2
d.	Explain how the operating system coordinates between I/O hardware and I/O software.	5	CO5	K2

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