QP Code: RA23BTECH183 | Reg. No | | | | | | | | | | | AY 23

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

B. Tech (Sixth Semester - Regular) Examinations, April 2026

23BECOE36011 – Operating Systems

(ECE)

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. Embedded systems always run on real-time operating system"-Justify this statement.	CO1	K3
b. Define inter process communication (IPC).	CO2	K1
c. What are the requirements that a solution to the critical section problem must satisfy?	CO3	K2
d. Are there any conditions necessary for a system to reach a deadlock?	CO4	K3
e. Distinguish file from dictionary.	CO6	K2

PART – B **(10 x5=50 Marks)**

Answer ***ALL*** questions	Marks	CO #	Blooms Level
2. a. Compare and contrast different types of Operating Systems (Batch, Time-Sharing, Real-Time, Distributed, and Embedded).	5	CO1	K3
b. Describe the life cycle of a process using a labelled state transition diagram.	5	CO1	K2
(OR)			
c. Explain the importance of Process Control Blocks (PCBs) in maintaining process information and scheduling.	5	CO1	K3
d. Justify the need for Operating System services such as I/O management, protection, and file management.	5	CO1	K3
3.a. Consider the set of 5 processes whose arrival time & burst time are given below: Calculate the average waiting time & average turnaround time, if FCFS scheduling algorithm is followed.	5	CO2	K3

PID	Arrival Time (AT)	Burst Time(BT)
P1	4	5
P2	6	4
P3	0	3
P4	6	2
P5	5	4

b. Examine the role of Long-Term, Medium-Term, and Short-Term schedulers in managing process execution. Discuss how their interaction affects overall system performance.	5	CO2	K3
(OR)			
c. Consider following set of processes with arrival time & burst time are given below: If CPU scheduling policy is Round Robin with **time quantum = 2 units**, Calculate average waiting time & turnaround time.	5	CO2	K3

PID	Arrival Time (AT)	Burst time (BT)
P1	0	5
P2	1	4
P3	2	2
P4	4	1

d. What is a Critical Section problem? Give the conditions that a solution to the critical section problem must satisfy.	5	CO3	K2

4.a.	Discuss the four necessary conditions for deadlock occurrence with suitable examples.	5	CO4	K2
b.	Consider the following system snapshot and determine whether the system is in a safe state using the Banker's Algorithm.	5	CO4	K3

Process	Allocation A B C	Max A B C	Available A B C
P1	0 1 0	7 5 3	3 3 2
P2	2 0 0	3 2 2	
P3	3 0 2	9 0 2	
P4	2 1 1	2 2 2	
P5	0 0 2	4 3 3	

a) Calculate Need matrix.
b) Determine if the system is in a safe state and list the safe sequence, if any.

(OR)

c.	Describe the resource allocation graph (RAG) and how it helps in identifying deadlocks.	5	CO4	K2
d.	Identify which deadlock-handling method (Prevention, Avoidance, or Detection) would best suit a real-time operating system and justify your choice.	5	CO3	K3
5.a.	Explain the difference between logical and physical address spaces with an example.	5	CO5	K2
b.	Given the reference string: {1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5} and 4-page frames, calculate page faults for Optimal and LRU algorithms and identify which performs best.	5	CO5	K3

(OR)

c.	Consider the following page reference string: 1, 2, 3, 4, 2, 1, 5, 6, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for the FIFO page replacement algorithms assuming three and four frames?	5	CO5	K3
d.	For the Page Reference String: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0. 1. 7, 0, 1, 2 Calculate the page faults applying Optimal Page Replacement Algorithms for a memory with three & four frames.	5	CO5	K3
6.a.	Consider the following disk queue: {98, 183, 37, 122, 14, 124, 65, 67} Initial head position = 53 (a) Draw the disk head movement diagram for: (i) FCFS (ii) SSTF (b) Calculate the total head movement for each.	5	CO6	K3
b.	Write briefly about file attributes, operations and types.	5	CO6	K2

(OR)

c.	Suppose that the head of a moving hard disk with 200 tracks, numbered 0 to 199, is currently serving a request at track 90. Consider a disk queue sequence is 176, 79, 34, 120, 11, 137, 62, 58. What is the total number of head movements needed to satisfy these requests for the FCFS and SSTF disk-scheduling algorithms?	5	CO6	K3
d.	Explain different directory structures (single-level, two-level, tree-structured, acyclic graph) with examples.	5	CO6	K2

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