(CS SF)

I[st] CLASS TEST 2024-25

IV[th] SEMESTER

OPERATING SYSTEM

TIME: 1 Hr **Max Marks:20**

Note: Attempt all sections. If require any missing data, then choose suitably.

2. Attempt any four questions of the following: 5 x 4 = 20

Q. No.	Questions	Marks	CO
a	What is the role of a "Time Quantum" in the Round Robin scheduling algorithm? Explain how its size can affect the system's overall performance. Consider five processes P1 to P5 arrived at same time. They have estimated running time 8,4,9,5 and 3 seconds respectively. Their Priorities are 2, 1, 3, 4, and 5 respectively with 5 being highest priority. Find the average turnaround time and average waiting time for Round Robin(tq=4) and priority scheduling algorithm.	5	2
b	What is a Process Control Block (PCB)? Explain its structure and the role it plays in process management. Describe the concept of a "Context Switch." How does the OS perform a context switch when a process is suspended or resumed?	5	2
c	Explain the role of the kernel in an operating system. What is a reentrant kernel in an operating system? What is a microkernel, and how does it differ from a monolithic kernel? What are the advantages and disadvantages of monolithic kernels over microkernels?	5	1
d	Draw process states transition diagram. Explain each transition among them in details with neat diagram.	5	2
e	Differentiate between preemptive and non- preemptive scheduling. Solve following by SJF preemptive and non-preemptive. Consider five processes P1 to P5 with their arrival times 3, 1, 4, 0, 2 and burst times 1, 4, 2, 6, 3 respt. Draw Gantt Chart, average waiting time and average turnaround time. Which one is better as per average turnaround time?	5	2

INSTITUTE OF ENGINEERING & TECHNOLOGY, LUCKNOW

Printed Pages: 01 Subject Code: ICS401

Roll No. | | | | | | | | | | | |

B.TECH (CS REGULAR)
Ist CLASS TEST 2023-24
IV^th SEMESTER
OPERATING SYSTEM

TIME: 1 Hr **Max Marks:20**

Note: Attempt all sections. If require any missing data, then choose suitably.

1. **Attempt any four questions of the following:** 5 x 4 = 2

Q. No.	Questions	Marks	CO
a	Consider five processes P1 to P5 arrived at same time. They have estimated running time 10,2,6,8 and 4 seconds respectively. Their Priorities are 3,2,5,4 and 1 respectively with 5 being highest priority. Find the average turnaround time and average waiting time for Round Robin(tq=3) and priority scheduling algorithm.	5	2
b	Consider a system with 5 processes and 3 resource types and at time T_0 the following snapshot of the system has been taken:	5	2

	ALLOCATED			MAXIMUM			AVAILABLE		
Process ID	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	1	1	2	4	3	3	3	1	0
P2	2	1	2	3	2	2			
P3	4	0	1	9	0	2			
P4	1	2	0	7	5	3			
P5	0	1	2	11	2	3			

a. Determine the total amount of resources of each type.
b. Compute the need matrix.
c. Determine if the state is safe or not using Banker's algorithm.
d. Would the P1 <3,3,1> request be granted in the current state?

c	Explain in detail about the Multiuser Systems and Multithreaded Systems.	5	1
d	Draw process states transition diagram. Explain each transition among them in details with neat diagram	5	3
e	Differentiate between preemptive and non- preemptive scheduling. Solve following by SJF preemptive and non-preemptive. Draw Gantt Chart average waiting time and average turnaround time. Which one is better as per average turnaround time?	5	1

Process	Arrival Time	Burst Time
P1	0.0	8
P2	0.4	4
P3	1.0	1

Department Of Computer Science and Engineering
Institute Of Engineering and Technology, Lucknow
B. Tech.(CSE) Class Test-II
Operating System (KCS-401)

Duration: 1 hour
Note: Attempt ALL Questions. Maximum Marks: 30

1) Explain Peterson's solution for achieving mutual exclusion

2) What is semaphore? Find the output of the following code

Suppose we want to synchronize two concurrent processes P and Q using binary semaphores S1 and S2. The code for the processes P and Q is shown below.

P	Q
Wait(S1);	**Wait(S2);**
Wait(S2):	**Wait(S1);**
Critical Section	**Critical Section**
Signal(S1);	**Signal (S2);**
Signal(S2);	**Signal S1);**

3) Explain Readers &writers problem with its solution.

4) Consider five memory partitions of size 100 KB, 500 KB, 200 KB, 450 KB and 600 KB in same order. If sequence of requests for blocks of size 212 KB, 417 KB, 112 KB and 426 KB in same order. then which of the algorithm among first fit, best fit, worst fit makes efficient use of memory?

5) Calculate page faults for (LRU, FIFO, OPT) for following sequences where page frame is three.

0,1,2,1,4,2,3,7,2,1,3,5,1,2,5.

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Subject Code: BCS-401 Roll No: 1

B.TECH.
(SEM IV) EVEN SEMESTER EXAMINATION 2023-24
OPERATING SYSTEMS

[TIME: 3 hrs.] [Max. Marks: 70]

Note: *Attempt All Questions. All Question carry equal marks.*

Q1. Answer ALL parts. Marks

(a) Define the functions of operating systems. Write a note on multi programmed operating systems. 3.5

(b) Explain the concept of a system call with an example. Mention major categories of System Calls. 3.5

(c) Explain the layered approach of operating system with diagram 3.5

OR

Explain dual mode operation in OS.

(d) Define context switching in the context of operating systems. Describe the steps involved in a context switch. 3.5

OR

Explain operating system services with respect to user and system.

Q2. Answer ALL parts.

(a) Calculate average waiting time and average turnaround time for the following snapshot of process using i) SRTF ii) RR scheduling (quantum slice 2 unit) Also draw the Gantt Chart 7

	Arrival Time	Burst Time
P1	0	7
P2	1	3
P3	2	1
P4	3	3

(b) Define deadlock. How does deadlock avoidance differ from deadlock prevention? Write deadlock avoidance algorithm. 7

OR

Snapshot of a system is given as

	Allocation	Max	Available
	A B C	A B C	A B C
P0	0 0 2	0 0 4	1 0 2
P1	1 0 0	2 1 0	
P2	1 3 5	1 3 7	
P3	6 3 2	8 4 2	
P4	1 4 3	1 5 7	

Using banker's algorithm answer the following questions:

(i) What is the content of the matrix need?

(ii) Whether the system is in safe state or not. If state is safe how it is possible for all processes to complete.

(iii) If process P2 request for resources (0,0,2), can the request be immediately granted?

Q3. Answer ALL parts.

(a) Free memory holes of sizes 50 KB, 400 KB, 130 KB, 300 KB, 150 KB, and 70 KB (in that order) are available. The processes of size A = 230 KB, B =180 KB, C = 130 KB, D = 120 KB, E = 200 KB(in order) is to be allocated. How processes are placed in first fit, best fit, worst fit. Calculate internal as well as external fragmentation. 7

(b) Describe the working of the Demand Paging mechanism. How does it help in the efficient utilization of memory? 7

OR

How many page faults would occur for the following replacement algorithms, assuming three page frames? All the frames are initially empty, page reference string is as: 4 , 7, 6, 1, 7, 6, 1, 2, 7, 2 ,6, 1, 2

(i) FIFO page replacement
(ii) LRU page replacement
(iii) OPTIMAL page replacement

Q4. Answer ALL parts.

(a) (i) Define critical sections? Write key requirements that any solution to the critical section problem must satisfy. 7

(ii) What is the main objective of process synchronization in a multi-process system?

(b) Explain how semaphore provide solution of Readers writers problem. 7

OR

(i) Explain binary semaphores with the help of suitable example.

(ii) The following two functions P1 and P2 that share a variable B with an initial value of 2 execute concurrently.

```
P1( ) {                P2( ) {
 C = B – 1;             D = 2 * B;
 B = 2 * C;             B = D - 1;
}                      }
```

Find the number of distinct values that B can possibly take after the execution .

Q5. Answer ALL parts.

(a) Define file allocation in the context of an operating system. Describe the types of file allocation methods with a suitable diagram. 7

(b) What is disk scheduling? Explain the C-SCAN scheduling by giving an example. 7

OR

The disk queue in the request for input output to block on cylinders
23, 89, 34, 132, 42, 187
Currently the head is at 100. Total 200 cylinders (0-199).Compute the total head movement for the following disk scheduling algorithms:
FCFS, SSTF, SCAN and C-SCAN.

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Subject Code: KCS-401

Roll No.: | | | | | | | | | | | | 2 |

B.TECH.
(SEM IV) EVEN SEMESTER EXAMINATION 2022-23
OPERATING SYSTEMS

[TIME: 3 hrs.] [Max. Marks: 100]

Note: *Attempt All Questions. All Question carry equal marks.*

Q1. Answer ALL parts. Marks

(a) Define operating system. List various services provided by an operating system and explain them in brief. 5

(b) Define Multiprogramming and Multitasking. 5

(c) Explain about the dual mode operation in OS with a neat block diagram. 5

OR

What are the types of System calls? List any four-process management system call.

(d) Explain the layered approach of operating system, also mention its advantages and disadvantages 5

OR

Explain Operating System as resources manager

Q2. Answer ALL parts.

(a) (i) Define critical sections? What are the requirements that a solution to the critical section problem must satisfy? 10

(ii) Define process synchronization and explain Peterson solution algorithms

(b) Explain dinning philosopher problem. Explain its solution with semaphore 10

OR

(i) Explain binary semaphores. Explain producer consumer problem using semaphore.

(ii) Suppose we want to synchronize two concurrent processes P and Q using binary semaphores S1 and S2. The code for the processes P and Q is shown below-

```
P                          Q
While (1)                  While (1)
{                          {
Wait(S1);                  Wait (S2);
Wait (S2);                 Wait (S1);
Critical Section           Critical Section
Signal(S1);                Signal (S1);
Signal (S2);               Signal (S2);
}                          }
```

Find the output of the above code.

Q3. Answer ALL parts.

(a) (i) Define process and specify the possible states of a process with diagram 10

(ii) Explain the working of different type of process schedulers.

OR

Calculate average waiting time and average turnaround time if quantum slice is 3 unit in RR scheduling as given below. Compare it with SJF.

	AT	BT
P1	5	4
P2	4	6
P3	3	8
P4	1	9
P5	2	2
P6	6	3

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(b) Define deadlock. What are the conditions for deadlock? Explain deadlock detection with several instances of a resources type.

OR

Snapshot of a system is given as

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

Using banker's algorithm answer the following questions:

(i) What is the content of the matrix need?

(ii) Whether the system is in safe state or not? If state is safe, how it is possible for all processes to complete.

(iii) If process P1 request for resources (0,4,2,0), can the request be immediately granted?

Q4. Answer ALL parts.

(a) Explain the difference between internal and external fragmentation. How fragmentation is handled in Paging memory management technique? 10

OR

Five memory holes of sizes 15K, 10K, 5K, 25K, 30K, 40K are available. The processes of size 12K, 2K, 25K, 20K is to be allocated. How processes are placed in first fit, best fit, worst fit? Calculate internal as well as external fragmentation.

(b) On a simple paging system with 2^24 bytes of physical memory, 256 pages of logical address space, and a page size of 2^10 bytes, how many bits are in logical address? 10

OR

How many page faults would occur for the following replacement algorithms, assuming three page frames? All the frames are initially empty, page reference string is as:

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

(i) FIFO page replacement

(ii) LRU page replacement

(iii) OPTIMAL page replacement

Q5. Answer ALL parts.

(a) Discuss the contiguous, Linked, and Indexed file allocation schemes. Which allocation scheme will minimize the amount of space required in directory structure and why? 10

OR

The disk queue in the request for input output to block on cylinders

95, 180, 34, 119, 11, 121, 62, 64

Currently the head is at 50. Compute the total head movement for the following disk scheduling algorithms:

FCFS, SSTF, SCAN and C-SCAN.

(b) What are the different file organizations? Describe access mechanism of each. 10

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Subject Code: KCS-401 **Roll No.:**

B.TECH.
(SEM IV) EVEN SEMESTER EXAMINATION 2022-23
OPERATING SYSTEMS

[TIME: 3 hrs.] **[Max. Marks: 100]**

Note: ***Attempt All Questions. All Question carry equal marks.***

Q1. Answer **ALL** parts. Marks

(a) Define operating system. List various services provided by an operating system and explain them in brief. 5

(b) Define Multiprogramming and Multitasking. 5

(c) Explain about the dual mode operation in OS with a neat block diagram. 5

OR

What are the types of System calls? List any four-process management system call.

(d) Explain the layered approach of operating system, also mention its advantages and disadvantages 5

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Q2. Answer **ALL** parts.

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OR

(i) Explain binary semaphores. Explain producer consumer problem using semaphore.

(ii) Suppose we want to synchronize two concurrent processes *P* and *Q* using binary semaphores S1 and S2. The code for the processes P and Q is shown below-

```
P
While (1)
{
Wait(S1);
Wait (S2);
Critical Section
Signal(S1);
Signal (S2);
}
```

```
Q
While (1)
{
Wait (S2);
Wait (S1);
Critical Section
Signal (S1);
Signal (S2);
}
```

Find the output of the above code.

Q3. Answer **ALL** parts.

(a) (i) Define process and specify the possible states of a process with diagram 10

(ii) Explain the working of different type of process schedulers.

OR

Calculate average waiting time and average turnaround time if quantum slice is 3 unit in RR scheduling as given below. Compare it with SJF.

	AT	BT
P1	5	4
P2	4	6
P3	3	8
P4	1	9
P5	2	2
P6	6	3

Define deadlock. What are the conditions for deadlock? Explain deadlock detection with several instances of a resources type. 10

OR

Snapshot of a system is given as

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

Using banker's algorithm answer the following questions:
(i) What is the content of the matrix need?
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Answer **ALL** parts.
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OR

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On a simple paging system with 2^24 bytes of physical memory, 256 pages of logical address Space, and a page size of 2^10 bytes, how many bits are in logical address? 10

OR

How many page faults would occur for the following replacement algorithms, assuming three page frames? All the frames are initially empty, page reference string is as:

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1
(i) FIFO page replacement
(ii) LRU page replacement
(iii) OPTIMAL page replacement

Answer **ALL** parts.
Discuss the contiguous, Linked, and Indexed file allocation schemes. Which allocation scheme will minimize the amount of space required in directory structure and why? 10

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Currently the head is at 50. Compute the total head movement for the following disk scheduling algorithms:
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