



## MCKV Institute of Engineering

Paper Code: PC-IT 502

### OPERATING SYSTEMS

Time Allotted: 1 Hour

Full Marks: 30

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

#### Group – A

##### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any **five** of the following: 5×1
- What is the purpose of Resource allocation graph?  
a) To represent deadlock      b) To detect deadlock  
c) To avoid deadlock      d) To prevent deadlock.
  - The main purpose of OS is  
a) To provide the users an environment to execute programs  
b) To manage computer resource      c) Both (a) & (b)      d) None of these.
  - A memory page containing a heavily used variable that was initialized very early and is in constant use is removed when \_\_\_\_\_ page replacement algorithm is used.  
a) LRU      b) LFU      c) FIFO      d) None of these.
  - Which Page replacement algorithm give the lowest page fault rate?  
a) LRU      b) FIFO      c) Optimal Page replacement      d) None of these
  - Compaction is used to solve the problem of  
a) External fragmentation      b) Internal fragmentation      c) Starvation      d) Thrashing.
  - Main function of linker is  
a) Relocation      b) Linking      c) Both (a) & (b)      d) Loading.

#### Group – B

##### (Short Answer Type Questions)

Answer any **two** of the following

2×5

- mural*
2. What is your opinion of "All unsafe states may not lead to deadlock"? [Module 3/CO1/ Evaluate - IOCQ] 5  
 3. What are the necessary conditions for deadlock? [Module 4/CO2/Understand-IOCQ] 5  
 4. How would you explain internal fragmentation? [Module 4/CO2/Understand-IOCQ] 5

**Group - C**  
**(Long Answer Type Questions)**

Answer any *one* of the following

**1×15**

- Q 5. a) Considering a system with five processes P0 through P4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances.

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Answer the following questions using the Banker's algorithm:

- i) What is the content of the matrix need? ii) Is the system in a safe state ?  
 iii) If a request from process P1 arrives for (1, 0, 2) can the request be granted immediately? [Module 3/CO2/Evaluate-HOCQ] 12  
 b) How would you define safe and unsafe states? [Module 3/CO2/Understand-IOCQ] 3  
 6. a) Consider the following snapshot of a system where ri (i = 1..4) denote resource types and P1 to P5 denote processes. The vector 'Available' has usual meaning. Available:

Current Allocation:   Maximum Demand								
Process	r1	r2	r3	r4	r1	r2	r3	r4
P1	0	0	1	2	0	0	1	2
P2	1	0	0	0	1	7	5	0
P3	1	3	5	4	2	3	5	6
P4	0	6	3	2	0	6	5	2
P5	0	0	1	4	0	6	5	6

r1	r2	r3	r4
1	5	2	0

- i) What is the content of the matrix need?  
 ii) Is this system currently in a safe state? Justify your answer. [Module 3/CO2/Evaluate-HOCQ] 12  
 b) How can you describe external fragmentation? [Module 4/CO2/Understand-IOCQ] 3



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#### Group – A

##### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any *five* of the following: 5×1

- i. SPOOLING stands for
  - a) Spontaneous Peripheral Operation Online
  - b) Small Peripheral Operation Online
  - c) Simultaneous Peripheral Operation Online
  - d) None of these
- ii. What is shell?
  - a) It is a hardware component.
  - b) It is a command interpreter
  - c) It is a part in compiler
  - d) It is a tool in CPU scheduling.
- iii. Scheduling a process from Ready Queue to CPU is done by
  - a) Short term Scheduling
  - b) Middle term Scheduling
  - c) Long term Scheduling
  - d) Dispatcher.

- iv. IPC stands for
- Internal Program Controller
  - Internal Process Control
  - Interprocess Communication
  - None of these
- v. Suppose that a process is in BLOCKED state waiting for some I/O service. When the service is completed. It goes to the
- RUNNING State
  - READY State
  - SUSPENDED State
  - TERMINATED State
- vi. Which of the following reduces degree of multiprogramming?
- Short term Scheduling
  - Middle term Scheduling
  - Long term Scheduling
  - All of these

(32) (32)

#### Group - B

##### (Short Answer Type Questions)

Answer any *two* of the following

$2 \times 5$

2. What is response time? With the help of state transition diagram, explain the various state of a process.  $2+3=5$
3. What is the difference between a Program and a process? Differentiate between multiprogramming and multitasking OS.  $3+2=5$
4. What is context switching? Why is it considered to be an overhead?  $2+3=5$

#### Group - C

##### (Long Answer Type Questions)

Answer any *one* of the following

$1 \times 15$

5. What do you mean by scheduler? Explain different types of scheduler. Explain CPU scheduling criteria.  $2+ (2+4+2) +5=15$
6. What is Process Control Block? Discuss the structure of PCB (Process Control Block). Mention the main characteristic each of Time sharing system, Batch processing system and Distributed system.  $1+5+9=15$

2.36



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#### Group - A

##### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any *five* of the following:

5×1

- i. SPOOLING stands for
  - a) Spontaneous Peripheral Operation Online b) Small Peripheral Operation Online
  - c) Simultaneous Peripheral Operation Online d) None of these.
- ii. Which of the following reduces degree of multiprogramming?
  - a) Short term Scheduling b) Middle term Scheduling
  - c) Long term Scheduling d) All of these.
- iii. What is shell?
  - a) It is a hardware component. b) It is a command interpreter
  - c) It is a part in compiler d) It is a tool in CPU scheduling.
- iv. Time Sharing Operating system has
  - a) High throughput b) low execution time
  - c) Faster I/O d) none of these.
- v. Scheduling a process from Ready Queue to CPU is done by
  - a) Short term Scheduling b) Middle term Scheduling
  - c) Long term Scheduling d) Dispatcher.
- vi. The number of processes completed per unit time is known as
  - a) Output b) Throughput
  - c) Efficiency d) Capacity.

$T_{AT} = \text{Completion time} - \text{Arrival time}$

$L_{Waiting} = T_{AT} - \text{Burst time}$

### Group - B

#### (Short Answer Type Questions)

Answer any *two* of the following

$2 \times 5$

- 1) How could you differentiate between Process & Program? [Module 3/CO1/Apply-IOCQ] 5
- 2) How would you compare the characteristic each of Time Sharing System and Batch Processing System? [Module 1/CO1/Understand-IOCQ] 5
- 3) How would you compare between Preemptive and Non- Preemptive Scheduling algorithms? [Module 3/CO1/Apply-IOCQ] 5

### Group - C

#### (Long Answer Type Questions)

Answer any *one* of the following

- 5) a) How can you define Process state? [Module 3/CO1/Remember -IOCQ]. With the help of a state transition diagram, explain various states of a process. [Module 3/CO1/Understand-IOCQ] [2+5]
- b) Consider the following set of process. CPU burst time of them are given in milliseconds.

Process	CPU Burst Time
P1	30
P2	6
P3	8

Draw the Gantt chart for FCFS scheduling where time quantum  $q = 5$  milliseconds. Calculate the average waiting time, average turnaround time and average response time. [Module 3/CO2/Evaluate-HOCQ]

- 6) a) How would you define scheduler? Explain different types of scheduler. [Module 1/CO1/Understand-IOCQ] 8
- b) How would you compare the different types of scheduling queues in process & explain each of these? [Module 3/CO1/ Understand -IOCQ] 5
- c) How would you explain CPU scheduling criteria? [Module 3/CO1/ Apply -HOCQ] 5



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#### Group - A

##### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any *five* of the following: 5×1
- Moving process from main memory to disk is called
    - Caching
    - Termination
    - Swapping
    - Interruption.
  - An address generated by CPU is commonly referred to as
    - Logical address
    - physical address
    - Relational address
    - virtual address
  - For real time operating systems, interrupt latency should be \_\_\_\_\_
    - zero
    - minimal
    - Maximum
    - dependent on the scheduling
  - Concurrent process are those who
    - Do not overlap time
    - Overlap in time
    - Are exerted by a process at the same time
    - None of these.
  - Banking algorithm in an operating system is used for
    - Deadlock avoidance
    - deadlock recovery
    - Mutual exclusion
    - context switching.
  - With a single resource, deadlock occurs
    - If there are more than two processes competing for that resource
    - If there are only two processes competing for that resource
    - If there is a single process competing for that resource

*Please answer in  
check.*

d) None of these.

vii. For real time operating systems, interrupt latency should be \_\_\_\_\_

- a) zero                    b) minimal  
c) maximum                d) dependent on the scheduling

### Group - B

#### (Short Answer Type Questions)

Answer any *two* of the following

$2 \times 5$

1. What are the differences between process and thread?  $3+2=5$   
2. "All unsafe states may not lead to deadlock." — Why or why not? 5  
3. Explain necessary condition of deadlock. 5

### Group - C

#### (Long Answer Type Questions)

Answer any *one* of the following

$1 \times 15$

5. a) Explain the deadlock detection mechanism in case of single instance of each resource type.

$5+10=15$

6. a) Explain Kernel level thread.  $5+10=15$

b) Consider the following snapshot of a system where

$r_i$  ( $i = 1 \dots 4$ ) denote resource types and  $P_1$  to  $P_5$

denote processes. The vector 'Available' has usual meaning.

*Available:*

$r1$	$r2$	$r3$	$r4$
2	1	0	0

*Current allocation:*

*maximum demand:*

<i>Process</i>	$r1$	$r2$	$r3$	$r4$	$r1$	$r2$	$r3$	$r4$
P1	0	0	1	2	0	0	1	2
P2	2	0	0	0	2	7	5	0
P3	0	0	3	4	6	6	5	6
P4	2	3	5	4	4	3	5	6
P5	0	3	3	2	0	6	5	2

- i) What is the content of the matrix need?  
ii) Is this system currently in a safe state? Justify your answer.

27 32

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## MCKV Institute of Engineering

Paper Code: PC-CS 402

### Operating System

Full Marks: 36

Time Allotted: 1 Hour

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

#### Group - A

##### (Multiple Choice Type Questions)



1. Choose the correct alternatives for any **five** of the following:

5×1

i. System software

- a) MS-Word, Excel, PowerPoint
- b) Text Editor, OS
- c) Assembler, Loader, Browser
- d) Assembler, Loader, OS

ii. OS is a

- a) Computation time allocator
- b) Control allocator
- c) Resource allocator
- d) Execution environment allocator

iii. Process is a

- a) Program in execution
- b) Task at hand
- c) Job in system
- d) None

iv. Context of a process gets stored inside

- a) ready queue
- b) job queue
- c) process control block
- d) job control block

v. \_\_\_\_\_ is the optimal algorithm for long term scheduler.

- a) SJF
- b) FCFS
- c) RR
- d) Priority Scheduling

vi. Each thread has their own

- a) Memory Space
- b) Code Section
- c) Stack space
- d) Data section

2×5

### Group - B (Short Answer Type Questions)

Answer any *two* of the following

- ✓ Define OS. What are the functionalities of OS?
- ✓ What are the benefits of multithreading models?
- ✓ Draw Process State Diagram. Explain all states, their transitions.

1×15

### Group - C (Long Answer Type Questions)

Answer any *one* of the following

Q 5. Consider the following Scenario:

Process	Arrival Time	Execution Time
P1	0	5
P2	1	4
P3	2	3
P4	3	6

Draw the Gantt chart for the execution of the processes and find out the average turnaround time following Round Robin CPU Scheduling Algorithm with Time Quantum 2.

Q 6. Consider the following Scenario:

Process	Arrival Time	Execution Time
P1	0	5
P2	1	4
P3	2	3
P4	3	7
P5	4	6

Draw the Gantt chart for the execution of the processes and find out the average waiting time following Shortest Remaining Time First CPU Scheduling Algorithm.

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## MCKV Institute of Engineering

Paper Code: PC-CS402

Operating System

Time Allotted: 3 Hours

Full Marks: 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

### Group - A

#### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following:

$10 \times 1 = 10$

(i) The semaphore whose value is either zero or one is known as

a) Binary semaphore    b) Mutex semaphore    c) Counting semaphore    d) Exclusion semaphore

(ii) Semaphore is the \_\_\_\_\_ solution to the process synchronization problem

a) Hardware    b) Software    c) Both hardware and software    d) None

(iii) When a process does not get access to the resource, it loops continually for the resource and wastes CPU cycles. It is known as,

a) Deadlock    b) Livelock    c) Mutuallock    d) Spinlock

(iv) The operations that cannot be overlapped or interleaved with executions of any other operations are known as,

a) Mutual exclusion    b) Atomic operation    c) Progress    d) Bounded wait

(v) What is/are the operation/s defined on semaphore

a) Wait    b) Signal    c) Both    d) None

(vi) Acquiring lock on critical section is associated with

a) Entry section    b) Exit section    c) Critical section    d) Remainder section

(vii) Need Matrix in Banker's algorithm

a) Max – Available    b) Total\_Resource – Available    c) Max–Allocation    d) Total\_Resource – Allocation

- (viii) Full and empty semaphores for mutex implementation of Producer-Consumer problem are respectively initialized with  
 a)0 and 1      b)1 and 0      c)0 and n      d)n and 0
- (ix) Banker's Algorithm is a/an  
 a) Deadlock Avoidance Algorithm      b) Deadlock Recovery Algorithm  
 c) Deadlock Prevention Algorithm      d) All of these
- (x) The time taken for the desired sector to rotate to the disk head is called \_\_\_\_\_  
 a) positioning time      b) random access time      c) seek time      d) rotational latency
- (xi) Which of the following page replacement algorithms suffers from Belady's Anomaly?  
 a) Optimal replacement      b) LRU      c) FIFO      d) Both optimal replacement and FIFO
- (xii) PTBR contains the starting address of  
 a) Memory      b) TLB      c) Page table      d) Segment table

### Group - B

#### (Short Answer Type Questions)

Answer any **three** of the following

2. Write the semaphore implementation of the Dining Philosopher problem considering  $i^{\text{th}}$  philosopher. (Write proper variable initialization also.)  $3 \times 5 = 15$   
5
3. In a paging scheme, 16 bit addresses are used with a page size of 512 bytes. If the logical address is **0000010001111101**, how many bits are used for the page number and offset? Compute the page number and offset as well.  $2+3=5$
4. Explain Belady's anomaly with a proper example. 5
5. Explain the concept of Context Switching. Write down the differences between the User Level Thread and Kernel level Thread.  $3+2=5$
6. Draw **Process State Diagram**. Explain all states, their transitions and the role of scheduling queues within the lifetime of a process. 5

**Group-C****(Long Answer Type Questions)**Answer any ***three*** of the following

$$3 \times 15 = 45$$

Q. (a) Given empty memory partitions of 100K, 500K, 200K, 300K and 600K. How would each of the **First Fit**, **Best Fit** and **Worst Fit** algorithms place 212K, 417K, 112K, and 426K processes in order?

- (b) Evaluate the best algorithm concerning the most efficient use of memory? Explain your answer. Given memory partitions:

100K
500K
200K
300K
600K

(c) Define Semaphore. What are the operations that can be applied to semaphore? Give definitions of them.

- (d) What is the disadvantage of semaphore implementation? How can the disadvantage be overcome?

$$6+2 + (1+4) + (1+1) = 15$$

8.(a) Consider a disk queue with I/O requests on the following cylinders in their arriving orders:

67, 12, 15, 45, 48, 50, 109, 89, 56, 59, 34, 88, 130, 24, 109, 22

The disk head is assumed to be at cylinder 80 and moving in the direction of an increasing number of cylinders. The disk consists of a total of 150 cylinders. Calculate and show with a diagram the disk head movement using **SSTF**, **SCAN**, **LOOK** disk scheduling algorithms.

- (b) Explain Resource Allocation Graph (RAG) with a proper example.

9.a) Illustrate **race condition** with respect to process synchronization. Relate your explanation with an example.

- b) Find out average waiting time and average turnaround time using **Premptive SJF**, **Premptive Priority** and

**Round Robin** (quantum 4 milliseconds) CPU scheduling algorithms. Which one is the best algorithm with respect to the criteria mentioned above?

**Process      Burst Time      Priority      Arrival Time**

Process	Burst Time	Priority	Arrival Time
P1	12	5	0
P2	25	1	2
P3	3	3	3
P4	9	4	5
P5	13	2	6

$$3 + (3 \times 4) = 15$$

10. Consider the **following** machine state and answer the following:

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

a) Calculate the need matrix

b) Using Banker's Algorithm check whether the system is in a safe state or not

c) Mention the safe sequence for the above-mentioned machine state or not

d) If the request matrix of process P3 is [0, 0, 2] can it be granted

$$3+6+3+3=15$$

11.a) Consider a paging system with the page table stored in memory

(i) If a memory reference takes 200ns how long does a paged memory reference take?

(ii) If we add TLB and 75% of all page table references are found at TLB, what is the effective memory reference time (EAT)?

[Assumption: finding a page table entry in TLB takes 0 times]

Explain your answer.

b) Explain the Set Associative paging scheme with a labeled schematic diagram.

c) Write the difference between a page and a segment.

$$(4+4)+6+1=15$$



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### Operating System

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#### Group – A

##### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any **five** of the following:

5×1

(i) The semaphore whose value is either zero or one is known as

- a. Binary semaphore
- b. Mutex semaphore
- c. Counting semaphore
- d. Exclusion semaphore

(ii) When a process does not get access to the resource, it loops continually for the resource and wastes CPU cycles. It is known as,

- a. Deadlock
- b. Livelock
- c. Mutuallock
- d. Spinlock

(iii) The operations that cannot be overlapped or interleaved with executions of any other operations are known as,

- a. Mutual exclusion
- b. Atomic operation

- c. Progress
- d. Bounded wait

(iv) Part of code where more than one process access and update shared resource

- a. Entry section
- b. Critical section
- c. Exit section
- d. Remainder section

(v) \_\_\_\_\_ is an interprocess communication tool that protects shared resources.

- a. Message queue
- b. Shared Memory
- c. Semaphore
- d. Signal

(vi) full and empty semaphores for mutex implementation of Producer-Consumer problem are respectively initialized with

- a. 0 and 1
- b. 1 and 0
- c. 0 and n
- d. n and 0

### Group – B

#### (Short Answer Type Questions)

Answer any **two** of the following

2×5

- 2.State and Explain the conditions for deadlock.
- 3.Explain disk structure with a schematic diagram.
- 4.Explain resource allocation graph with an example.

### Group – C

#### (Long Answer Type Questions)

Answer any **one** of the following

1×15

- ? 5. Consider a system with following information, determine whether the system is in **safe state** and find the **safe string**.

Total Resource:

R1	R2	R3
15	8	8

Process	Max			Alloc		
	R1	R2	R3	R1	R2	R3
P1	5	6	3	2	1	0
P2	8	5	6	3	2	3
P3	4	9	2	3	0	2
P4	7	4	3	3	2	0
P5	4	3	3	1	0	1

6. Consider a disk queue with I/O requests on the following cylinders in their arriving order:  
54, 97, 73, 128, 15, 44, 110, 34, 45

The disk head is assumed to be at cylinder 23. Calculate and show with diagram the disk head movement using **FCFS** and **SSTF** disk scheduling algorithm. Evaluate which algorithm is more efficient in terms of total head movement requirement?



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## Group - A

### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any **five** of the following: **5×1=5**

i) What is an operating system?

- a) interface between the hardware and application programs
- b) collection of programs that manages hardware resources
- c) system service provider to the application programs

All of these.

ii) To access the services of the operating system, the interface is provided by the \_\_\_\_\_

- a) Library
- b) System calls
- c) Assembly instructions
- d) API

iii) What does FIFO scheduling stand for?

- a) First input-output scheduling
- b) First in first out scheduling
- c) Free input free output
- d) All of the above

iv) What is the full form of BIOS?

- a) Between input-output system
- b) Binary input-output system
- c) Basic input/output system
- d) All of the above

v) What is the main function of the command interpreter?

- a) to provide the interface between the kernel modules and application program
- b) to handle the files in the operating system
- c) to get and execute the next user-specified command
- d) None of these options.

vi) Which one of the following is **not true**?

- a) kernel remains in the memory during the entire computer session
- b) kernel is made of various modules which can not be loaded in running operating system
- c) kernel is the first part of the operating system to load into memory during booting
- d) kernel is the program that constitutes the central core of the operating system

**Group - B****(Short Answer Type Questions)**

2×5=10

Answer any *two* of the following

[(CO1)(Remember/LOCQ)]

[(CO1)(Understand/LOCQ)]

[(CO1)(Understand/LOCQ)]

- b) Describe the process state transition diagram with a neat diagram. [(CO1)(Understand/LOCQ)]

- c) Compare monolithic and bi-layered architecture of operating system. [(CO1)(Analyse)(LOCQ)]

**Group - C****(Long Answer Type Questions)**Answer any *one* of the following

- a) Define a process. Explain how it is different from a thread. [(CO2)(Understand/LOCQ)] (3)

- b) Explain the role of Process Control Block.

[(CO2)(Understand/LOCQ)] (3)

- c) Assuming Low Priority No as a high priority process, schedule the following system of processes using Priority Scheduling algorithm(Non-Preemptive) and calculate the average turn-around time and average waiting time: [(CO2)(Apply/LOCQ)] (9)

Process No	Arrival Time	Burst Time	Priority No
P1	1	10	3
P2	0	1	1
P3	2	2	4
P4	0	1	5
P5	1	5	2

- Q. a) Explain what is meant by Process Scheduling with respect to OS. [(CO2)(Understand/LOCQ)] (3)

- b) Describe why process Scheduling is important in an OS. [(CO2)(Understand/LOCQ)] (3)

- c) Calculate the average turn-around time and average waiting time for the following system of processes to be scheduled according to SRTF algorithm.

Process ID	Arrival Time	Burst Time
1	0	8
2	1	4
3	2	2
4	3	1
5	4	3
6	5	2

[(CO2)(Apply/LOCQ)] (9)

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Paper Name : Operating System

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## Group - A

### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any **five** of the following:

i) The operations that cannot be overlapped or interleaved with executions of any other operations are known as,

- a) Mutual exclusion
- b) Atomic operation
- c) Progress
- d) Bounded wait

ii) What is the full name of FAT?

- a) File attribute table
- b) File allocation table
- c) Font attribute table
- d) Format allocation table

iii) Banker's algorithm is used \_\_\_\_\_

a) To prevent deadlock      b) To deadlock recovery      c) To solve the deadlock

iv) When a process does not get access to the resource, it loops continually for the resource and wastes CPU cycles. It is known as,

a) Deadlock      b) Livelock      c) Mutuallock

d) Spinlock

v) \_\_\_\_\_ is not an approach to handling Deadlock in OS.

- a) Detect and recover
- b) Deadlock Avoidance
- c) Virtual memory
- d) Deadlock prevention

vi) \_\_\_\_\_ disc scheduling algorithm is known as 'Elevator algorithm'.

- (a) SCAN
- (b) FIFO
- (c) SSTF
- (d) LOOK

## Group - B

### (Short Answer Type Questions)

Answer any **two** of the following

**2x5=10**

2. Mention the necessary and sufficient conditions for deadlock to occur in a system of processes.

[CC2/(Understand/IOCQ)]

5

3. Mention the ways in which to resolve in case there is a deadlock in a system of processes.

[CO2/(Understand/HOCQ)]

5

4. Define deadlock with the respect of a system of processes. Prove that the four conditions for deadlock are necessary as well as sufficient.

[CO2/(Analyze/HOCQ)] 1+4

No + NR CREDONY  
Group - C

### (Long Answer Type Questions)

Answer any **one** of the following

$$1 \times 15 = 15$$

5. a) Identify the role of Resource Allocation Graph in detection of Deadlock.

[CO2/(Apply/HOCQ)]

$$3$$

- b) Contrast Sequential File Access technique from Random File Access Technique.

[CO4/(Analyze/HOCQ)]

$$4$$

- c) Suppose a disk drive has 300 cylinders, numbered 0 to 299. The current head position of the disk is at 80. The queue of pending requests, in FIFO order, is 36, 79, 15, 120, 199, 270, 89, and 180.

Calculate the average cylinder movements for Shortest Seek Time First (SSTF) and SCAN algorithm.

[CO4/(Apply/HOCQ)]

$$8$$

6. a) Compare Starvation with Deadlock.

- b) Compare SSTF and SCAN disk scheduling algorithms.

[CO4/(Evaluate/HOCQ)] 3

$$4$$

- c) Five processes are competing for resources R1, R2, R3 and R4 where

$$(R1, R2, R3, R4) = (6, 4, 4, 2).$$

The maximum claim of these processes and the initial resources allocated to these processes, are given in the following table.

Processes	MAX				Alloc			
	R1	R2	R3	R4	R1	R2	R3	R4
P1	3	2	1	1	2	0	1	1
P2	1	2	0	2	1	1	0	0
P3	1	1	2	0	1	1	0	0
P4	3	2	1	0	1	1	1	0
P5	2	1	0	1	0	0	0	1

Does this initial allocation lead to a safe state? Explain with reason.

- If P2 requests 2 instances of R1, 1 instance of R3, 1 instance for R4, check whether the system is still in safe state. If it is, find out the safe sequence of process execution.

[CO2/(Apply/HOCQ)]



## MCKV Institute of Engineering

Paper Code: PC-IT502  
Operating Systems

1

**Time Allotted: 3 Hours**

**Full Marks: 70**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

### Group - A

#### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any **ten** of the following:

$10 \times 1 = 10$

i) Scheduling a process from Ready Queue to CPU is done by

- a) Short term Scheduling      b) Middle term Scheduling  
 c) Long term Scheduling       d) Dispatcher.

ii) IPC stands for

- a) Internal Program Controller       b) Internal Process Control

c) Interprocess Communication      d) None of these

iii) Suppose that a process is in BLOCKED state waiting for some I/O service. When the service is completed. It goes to the

- a) RUNNING State       b) READY State  
 c) SUSPENDED State      d) TERMINATED State

iv) Which is not a layer of operating system?

- a) Kernel      b) Shell      c) Application program       d) Critical section.

v) CPU performance is measured through

- a) Throughput       b) MHz      c) Flaps      d) None of these.

- vi) The number of processes completed per unit time is known as \_\_\_\_\_.
- a) Output       b) Throughput      c) Efficiency      d) Capacity.
- vii) Virtual memory is
- a) An extremely large main memory       b) An extremely large secondary memory
- c) An illusion of an extremely large memory      d) A type of memory used in supercomputer
- viii) Concurrent process are those who
- a) Do not overlap time      b) Overlap in time
- c) Are exerted by a process at the same time      d) None of these.
- ix) Variable partition memory allocation can lead to
- a) External fragmentation      b) Internal fragmentation
- c) Both a) and b)      d) None of these.
- x) Page fault occurs when
- a) the page is corrupted by application software      b) the page is not in main memory
- c) the page is in main memory      d) one tries to divide a number by 0.
- xi) For real time operating systems, interrupt latency should be \_\_\_\_\_.
- a) zero       b) minimal      c) maximum      d) dependent on the scheduling
- xii) An address generated by CPU is commonly referred to as
- a) logical address      b) physical address      c) relational address      d) virtual address

### Group - B

#### (Short Answer Type Questions)

Answer any *three* of the following

$3 \times 5 = 15$

- Q1. Define Process. What is Process state? With the help of a state transition diagram, explain various states of process.
- Q2. What do you mean by scheduler? Explain different types of scheduler.
- Q3. What are the Differences between Preemptive and Non-Preemptive Scheduling algorithms?

$1+1+3 = 5$

Page 2 of 4

Q5. What are the differences between process and thread? What are different types of threads?

2+3

Why are page sizes always powers of 2?

What is the difference between logical and physical addresses?

### Group - C

#### (Long Answer Type Questions)

3×15=45

7.a) What are the advantages and disadvantages of SJF scheduling?

7.b) Consider the following set of process. CPU burst time of them are given in milliseconds.

Process	Arrival Time	CPU Burst Time
P1	0	8
P2	1	4
P3	2	5
P4	3	5
P5	5	2

Draw the Gantt chart for SRTF (Shortest Remaining Time First/ Pre-emptive SJF) Scheduling. Calculate the average waiting time, average turnaround time and average response time.

Q6) Differentiate between multiprogramming and multitasking OS.

Q7.a) What is the difference between content switching and mode switching?

b) Compare best fit and first fit algorithm for memory allocation.

c) Compare SSTF and C-SCAN algorithm in the context of disk scheduling.

d) How could you differentiate between Process & Program?

e) Consider the following snapshot of a system where  
 $r_i$  ( $i = 1..4$ ) denote resource types and  $P1$  to  $P5$  denote processes. The vector 'Available' has usual meaning.

Available:

	<i>r1</i>	<i>r2</i>	<i>r3</i>	<i>r4</i>
<i>r1</i>	2	1	0	0
<i>r2</i>				

Current allocation:

maximum demand:

<i>Process</i>	<i>r1</i>	<i>r2</i>	<i>r3</i>	<i>r4</i>	<i>r1</i>	<i>r2</i>	<i>r3</i>	<i>r4</i>
P1	0	0	1	2	0	0	1	2
P2	2	0	0	0	2	7	5	0
P3	0	0	3	4	6	6	5	6
P4	2	3	5	4	4	3	5	6
P5	0	3	3	2	0	6	5	2

i) What is the content of the matrix need?

ii) Is this system currently in a safe state? Justify your answer.

Q b) What are the different types of scheduling queues in process & explain each of these?

8+3+4

Q 0. a) What is context switching? Why is it considered to be an overhead?

Q b) What are the differences between process and thread?

c) "All unsafe states may not lead to deadlock." — Why or why not?

d) What is thrashing? What is its effect on the system?

5+3+3+4  
5x3=15

11. Write short notes on the following (*any three*):

✓ Shortest Remaining Time First (SRTF) scheduling.

✗ Kernel level thread

✓ c) Linked file allocation technique

o d) Distributed OS

e) Scan disk scheduling algorithm



## MCKV Institute of Engineering

Paper Code: PC-IT502

Paper Name: Operating Systems

**Time Allotted: 3 Hours**

**Full Marks: 70**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

### Group - A

#### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any **ten** of the following:  $10 \times 1 = 10$ 
  - (i) The page fault frequency in virtual memory is reduced when
    - a) The page size is reduced
    - b) processes are unbound
    - c) Locality of reference is applicable to the process
    - d) none of these.
  - (ii) An address generated by CPU is commonly referred to as
    - a) logical address
    - b) physical address
    - c) relational address
    - d) virtual address
  - (iii) Turnaround time is:
    - a) The total waiting time for a process to finish execution,
    - b) The total time spent in the ready queue.
    - c) The total time spent in the running queue,
    - d) The total time from the completion till the submission of a process.
  - (iv) Which of the following schemes suffers from External Fragmentation?
    - a) Segmentation
    - b) Paging
    - c) Paged segmentation
    - d) All of these.
  - (v) Scheduling is done so as to:
    - a) Increase the turnaround time
    - b) Decrease the turnaround time
    - c) Keep the turnaround time same
    - d) There is no relation between scheduling and TAT.
  - (vi) Suppose that a process is in BLOCKED state waiting for some I/O service. When the service is completed. It goes to the
    - a) RUNNING State
    - b) READY State
    - c) SUSPENDED State
    - d) TERMINATED State
  - (vii) With a single resource, deadlock occurs
    - a) If there are more than two processes competing for that resource
    - b) If there are only two processes competing for that resource

- c) If there is a single process competing for that resource      d) None of these.

(viii) Important objectives of computer security include  
a) Confidentiality      b) Integrity      c) Availability       d) All of these.

(ix) To enable a process to be larger than the amount of memory allocated to it, one can use  
 a) Overlays      b) Paging      c) Compaction      d) Swapping.

(x) Part of a program where the shared memory is accessed and which should be executed indivisibly, is called  
a) Semaphores      b) directory       c) Critical section      d) mutual exclusion.

(xi) SPOOLING stands for  
 a) Spontaneous Peripheral Operation Online      b) Small Peripheral Operation Online  
c) Simultaneous Peripheral Operation Online      d) None of these.

(xii) The general structure of a process consists of  
a) critical section      b) reminder section      c) race condition       d) both (a) and (b)

### Group - B

### (Short Answer Type Questions)

Answer any *three* of the following

$$3 \times 5 = 15$$

2. How would you compare the characteristic each of Time Sharing System and Batch Processing System? [Module 1/C01/Understand-10CQ] 5

11

3. What are the various ways of aborting a process in order to eliminate Deadlock?

With the help of state transition diagram, how would you explain the various state of a process? [Module 3/C01/ Understand-IOCO] 2+3

late C

4. How would you interpret the advantages and disadvantages of SIE scheduling?

[Module 3/C01/ Apply -HOCO]

11

5. Define Busy Waiting? How to overcome busy waiting using Semaphore operation?  
[Module 3/C01/ Understand-IOCO]

2-3

## 6. Discuss the structure of Process Control Block.

[Module 3/C01/Understand-JOC0]

### Group - C

### **(Long Answer Type Questions)**

Answer any *three* of the following

$$3 \times 15 = 45$$

Q.a) What do you define CPU scheduling? [Module 3/C01/ Understand-IOCQ]

2

b) How would you explain CPU scheduling criteria? [Module 3/C01/ Apply -HOCQ] 5

c) Consider the following set of process. CPU burst time of them are given in milliseconds.

Process	Arrival Time	CPU Burst Time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

Draw the Gantt chart illustrating their execution using SRTF (Shortest Remaining Time First/ Pre-emptive SJF), and Round Robin (quantum=2) Scheduling. Calculate the waiting time, average turnaround time, relative delay and average response time. [Module3/C01/Evaluate-HOCQ] 2x4

8.a) How would you define context switching? What characteristics are responsible for Categorizing it as overhead? [Module 4/ CO2/Remember-IOCQ] 1+3

b) How would you compare between Preemptive and Non- Preemptive Scheduling algorithms? [Module 4/CO2/Understand-LOCQ] 3

c) How would you explain "Why page sizes always powers of 2"?

[Module 4/CO2/Analyze-IOCQ] 2

d) How can you explain Belady's anomaly. [Module 4/ CO2/Analyze-IOCQ] 3

e) How can you explain the term compaction? [Module 4/ CO2/Analyze-IOCQ] 3

9.a) How would you define scheduler? [Module 3/C01/ Remember -LOCQ] 2

b) Explain different types of scheduler. [Module 3/C01/ Understand-IOCQ] 5

c) Consider the following snapshot of a system where  $r_i$  ( $i = 1..4$ ) denote resource types and  $P_1$  to  $P_5$  denote processes. The vector 'Available' has usual meaning.

Available:

$r1$	$r2$	$r3$	$r4$
12	58	29	06
14	17	8	
	92	12	

$$\begin{aligned}TT &= 13 \\NT &= 26.8 \\RT &= 9.25 \\RD &= 2.15\end{aligned}$$

Current Allocation: | Maximum Demand

Process	Current Allocation:				Maximum Demand			
	$r1$	$r2$	$r3$	$r4$	$r1$	$r2$	$r3$	$r4$
P1	0	0	1	2	0	0	18	2x4
P2	1	0	0	0	1	78	5	0
P3	1	3	5	4	2	3	5	6
P4	0	6	3	2	0x4	6	5	2
P5	0	0	1	4	0	6	5	6

3x6

8x11

- i) What is the content of the matrix need? 8  
 ii) Is this system currently in a safe state? Justify your answer.  
 [Module3/CO2/Evaluate-HOCQ]
9. a) Define Page fault. [Module 4/CO2/Analyze-IOCQ] 3  
 b) How can you describe the merits and demerits of a virtual memory system?  
 [Module4/CO2/Understand-IOCQ] 4
- e) Given references to the following pages by a program  
 0,9,0,1,8,1,8,7,8,7,1,2,8,2,7  
 Calculate the number of page faults that will occur for a program with 3 page frames available to it, using the FIFO replacement strategy and the LRU replacement strategy.  
 [Module 4 / CO2/Evaluate-HOCQ]  $4 \times 2$
10. a) How would you define safe and unsafe states?  
 [Module 3/CO2/Understand-IOCQ] 3  
 b) What are the necessary conditions for deadlock?  
 [Module 4/CO2/Understand-IOCQ] 3  
 c) How would you express to prevent deadlock?  
 [Module 4/CO2/Understand-IOCQ] 4  
 d) What is your opinion of "All unsafe states may not lead to deadlock"?  
 [Module3/CO1/Evaluate -IOCQ] 5
11. a) How would you classify the different types of attackers in the context of security? [Module 5 / CO3 / Understand-IOCQ] 5  
 b) What are the two major differences between segmentation and paging?  
 [Module 4/CO2/Understand-IOCQ] 5  
 c) Compare SSTF and C-SCAN algorithm in the context of disk scheduling.  
 [Module 4/CO2/Evaluate-IOCQ] 5

TTT

13 452



## MCKV Institute of Engineering

Paper Code: PC-CS402

Paper Name: Operating System

**Time Allotted: 3 Hours**

**Full Marks: 70**

*Candidates are required to give their answers in their own words as far as practicable.*

### Group - A

#### (Multiple Choice Type Questions)

1. Choose the correct alternatives for any **ten** of the following:

$$10 \times 1 = 10$$

- (i) Time taken by disk head to move from one cylinder to another one is
  - a) Seek time
  - b) Transfer time
  - c) Rotational latency
  - d) Disk latency
- (ii) C-Look achieves benefits of both
  - a) Scan and Look
  - b) C-SCAN and LOOK
  - c) Scan and FCFS
  - d) C-Scan and SSTF
- (iii) \_\_\_\_\_ disc scheduling algorithm is known as 'Elevator algorithm'.
  - a) SCAN
  - b) FIFO
  - c) SSTF
  - d) LOOK
- (iv) When multiple users sent print requests concurrently, all requests are handled through
  - a) Caching
  - b) Buffering
  - c) Spooling
  - d) Queuing
- (v) The device specific code is written into
  - a) Device controller
  - b) Device driver
  - c) Kernel I/O subsystem
  - d) Kernel device handler
- (vi) Fork is used for
  - a) Creation of new process
  - b) Dispatching of new process
  - c) Increasing priority of a process
  - d) Creation of new thread from process
- (vii) The default remedy of Starvation is
  - a) Ageing
  - b) Critical Section Solution
  - c) Mutual Exclusion
  - d) Buffering
- (viii) If the page size increases, the internal fragmentation also \_\_\_\_\_
  - a) Decreases
  - b) Increases
  - c) Remains constant
  - d) None of these
- (ix) What is the use of a banker's algorithm?
  - a) Rectify deadlock
  - b) Prevent deadlock
  - c) Solve deadlock
  - d) None of the above

(x) Throughput is

- a) Number of processes completed per time unit
  - b) Completion time of the whole process
  - c) Time for waiting in ready queue
  - d) Number of processes loaded into main memory per unit time

(xi) Where is the operating system placed in the memory?

- a) either low or high memory (depending on the location of interrupt vector)
  - b) in the low memory
  - c) in the high memory
  - d) none of these

(xii) \_\_\_\_\_ eliminates unnecessary seek operations.

- a) SCAN      b) FIFO      c) SSTF      d) LOOK

### **Group - B**

### **(Short Answer Type Questions)**

Answer any ***three*** of the following

$$3 \times 5 = 15$$

2. Mention the necessary and sufficient conditions for deadlock to occur in a system of processes.

[Module-3, CO2, Understand, IOCQ] [5]

3. Differentiate between distributed Operating System and Network Operating System.

[Module 1, CO1, Understand, IOCO] [5]

4. Define Process. Explain states of a process with process state diagram.

[Module 2, CO2, Understand, [OCO]]

5. Three processes P1, P2 and P3 of sizes 19900, 19990, 19888 bytes respectively. If partitions are of equal size of 20000 bytes, will there be any fragmentation? Can a process of size 200 bytes be accommodated?

[Module 5, CO4, Apply, HOCQ] [4+1]

6. Consider a logical address space with 8 pages of 1024 words each, mapped onto a physical memory on 32 frames. How many bits are in the logical address? How many bits are in the physical address?

[Module 6, CO4, Apply, HOCQ] [4+1]

## Group - C

### **(Long Answer Type Questions)**

Answer any ***three*** of the following

$$3 \times 15 = 45$$

7. a) What are Cooperative Processes? Explain with the context of Producer-Consumer problem.

[Module 4, CO3, Understand, IOCQ] [2+3]

b) Consider the following:-

Process	Burst Time	Priority	Arrival
P1	10	3	0
P2	1	1	0
P3	2	3	0
P4	1	4	1
P5	5	2	3

Draw a Gantt chart and evaluate the better scheduling algorithm between FCFS and Preemptive Priority scheduling with respect to average waiting time and average turnaround time.

c) Describe the role of shell of an Operating System. [Module 2, CO2, Apply, HOCQ] [6]

8.a) Identify the role of Resource Allocation Graph in detection of Deadlock. [Module-1, CO1, Understand/IOCQ] [4]

b) Is it possible to have a deadlock involving one single process? Briefly explain. [Module-3, CO2, Apply, IOCQ] [5]

c) Five processes are competing for resources R1, R2, R3 and R4 where  
 $(R1, R2, R3, R4) = (6, 4, 4, 2)$ . [Module 3, CO2, Understand, LOCQ] [2]

The maximum claim of these processes and the initial resources allocated to these processes, are given in the following table.

Processes	MAX				Alloc			
	R1	R2	R3	R4	R1	R2	R3	R4
P1	3	2	1	1	2	0	1	1
P2	1	2	0	2	1	1	0	0
P3	1	1	2	0	1	1	0	0
P4	3	2	1	0	1	1	1	0
P5	2	1	0	1	0	0	0	1

Does this initial allocation lead to a safe state? Explain with reason. If P2 requests 2 instances of R1, 1 instance of R3, 1 instance for R4, check whether the system is still in safe state. If it is, find out the safe sequence of process execution.

[Module 3, CO2, Apply, HOCQ] [5+3]

9.a) Describe the Dining Philosophers' problem. Propose a solution for the problem using semaphore. [Module-4/ CO3/(Create/HOCQ)] [2+4]

b) What are the disadvantages of semaphore? [Module 4, CO3, Understand, IOCQ] [4]

c) Differentiate Paging from Segmentation techniques of memory management in OSs

<sup>10</sup> a) Dictionnaire historique de la littérature française, 1962, t. I, p. 102.

[Module 5, CO4, Understand, 10CQ] [W]

## b) Descending Direct Mapping Method of Paging with a Diagram.

c) In a Paging System with TLRB, it takes 30 ns to search the TLRB and 90 ns to access memory.

be the hit ratio to achieve the effective memory access time. What should

[Module 5, c04, App] v. [HCC0] [6]

By being captain the write back and write through policies to perform write operation in

Module 3 CO2 Understanding [3]

11.a) What are different file allocation methods? Explain with examples.

b) Given memory partition of 100k, 500k, 200k, 300k, and 600k, in order. How would

of 212k, 417k, 112k and 426k in order? Which algorithm makes the most efficient use of

c) Explain the Set Associative paging scheme with a labeled schematic diagram

[Module 5, C04, Understand, H0cQ] [4]

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