

SARDAR PATEL UNIVERSITY
Master of Computer Application (M.C.A.) II Semester Examination
PS02CMCA24 Operating System Principles
15th April, 2019

Time: 10:00 a.m. to 1:00 p.m.

Total Marks: 70

Select most appropriate option for each of the following questions

- (i) Which scheduler keeps partially executed swapped out processes on a mass storage device for later execution to improve system performance ?
(A) short-term **(B) medium-term** (C) long-term (D) none of these.

(ii) A list of processes that are ready to run and kept in main memory is called
(A) a ready queue (B) a device queue (C) an I/O queue (D) none of these.

(iii) Which of the following is a CPU scheduling algorithm ?
(A) C-SCAN (B) LRU **(C) RR** (D) none of these.

(iv) The Peterson's solution to the critical section problem is used for _____ concurrent processes.
(A) 2 (B) 4 (C) 8 (D) none of these.

(v) Which approach to operating system design is best suited for debugging ?
(A) microkernel (B) modular **(C) layered** (D) none of these.

(vi) Which of the following parameters can be used to compare the performance of CPU scheduling algorithms ?
(A) job size **(B) average waiting time**
(C) amount of time a process spends on a CPU (D) none of these.

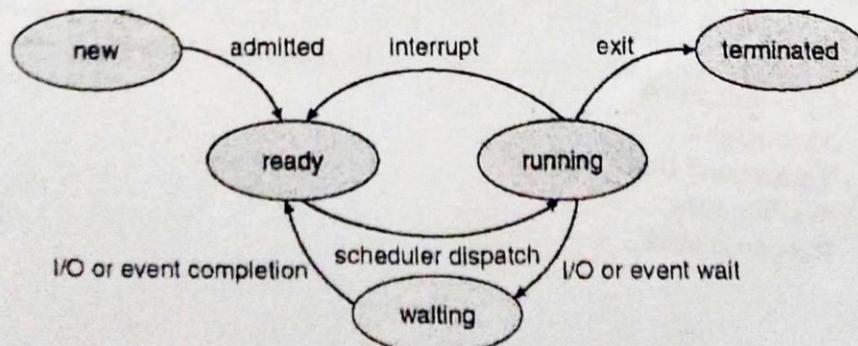
(vii) Which of the following algorithms is also called an elevator algorithm ?
(A) SRTF (B) SJF **(C) SCAN** (D) none of these.

viii) In which multithreading model only one thread can access a kernel at a time and multiple threads are unable to run in parallel on multiprocessors ?
(A) one-to-one **(B) many-to-one** (C) many-to-many (D) none of these.

2. Answer the following questions in brief (ANY SEVEN) :

- (i) Draw the process state diagram.

Answer :



- (ii) What is a PCB ? Which information does it contain ?

Answer :

A Process Control Block (PCB, also called Task Controlling Block) is a data structure in the operating system kernel containing the information associated with a specific process. Each process is represented in the operating system by a PCB. A PCB contains the following pieces of information about a process :

Process state,
Program counter,
CPU registers,
CPU-scheduling information,
Memory-management information,
Accounting information,
I/O status information, etc.

- (iii) What is a **thread** ? List the **benefits** of multithreaded programming.

Answer :

A **thread** is a **basic unit of CPU utilization**. It comprises a thread ID, a program counter, a register set, and a stack. It shares with other threads belonging to the same process its code section, data section, and other operating system resources, such as open files and signals. A traditional (or heavy-weight) process has a single thread of control. If a process has multiple threads of control, it can perform more than one task at a time.

Following are the benefits of multithreaded programming :

- Responsiveness
- Resource sharing
- Economy
- Scalability

- (iv) Which **criteria** can be used to compare CPU scheduling algorithms ?

Answer :

Following **criteria** can be used to compare CPU scheduling algorithms :

- CPU utilization
- Throughput
- Turnaround time
- Waiting time
- Response time

- (v) Explain the concept of a **virtual machine**.

Answer :

The fundamental idea behind a **virtual machine** is to abstract the hardware of a single computer (the CPU, memory, disk drives, network interface cards, and so forth) into **several different execution environments**, thereby creating the illusion that each separate execution environment is running its own private computer. By using CPU scheduling and virtual memory techniques, an operating system host can create an **illusion** that a process has its own processor with its own (virtual) memory. Each **guest process** is provided with a (virtual) copy of the underlying computer. Usually, the guest process is in fact an operating system, and that is how a **single physical machine can run multiple operating systems concurrently**, each in its own virtual machine.

- (vi) What is a **semaphore** ?

Answer :

A semaphore is a **synchronization tool**. A **semaphore S is an integer variable** that, apart from initialization, is **accessed only through two standard atomic operations : wait() and signal()**. The wait() operation was originally termed P (from the Dutch *proberen*, “to test”). The signal() operation was originally called V (from *verhogen*, “to increment”). The definition of wait() is as follows :

```
wait (S) {  
    while S <= 0  
        ; // no-op  
    S--;  
}
```

The definition of signal() is as follows :

```
signal (S) {  
    S++;  
}
```

All modifications to the *integer value* of the **semaphore** in the wait() and signal() operations **must be executed indivisibly**. That is, when one process modifies the semaphore value, no other process can simultaneously modify that same semaphore value. The testing of the integer value of S ($S \leq 0$), as well as its possible modification ($S--$) **must be executed without interruption**.

- (vii) Distinguish between a **process** and a **program**.

Answer :

A process is a **program in execution**. A process is more than a **program code**, which is sometimes known as the **text section**. It also includes the **current activity**, as represented by the value of the **program counter** and the contents of the processor's **registers**. A process generally also includes the process **stack**, which contains temporary data (such as function parameters, return addresses, and local variables), and a **data section**, which contains global variables. A process may also include a **heap**, which is memory that is dynamically allocated during process run time.

A **program** is a **passive entity**, such as a file containing a **list of instructions** stored on a disk, whereas a **process** is an **active entity**, with a **program counter** specifying the next instruction to be executed, and a **set of associated resources**. A program becomes a process when an executable file is loaded into memory.

- (viii) What are the main features of the **layered design** of an operating system ?

Answer :

The **operating system is broken into a number of layers (levels)**. The bottom layer (layer 0) is the hardware. The highest (layer N) is the user interface. An operating system layer is an implementation of an abstract object made up of data and the operations that can manipulate those data. A typical operating system layer – say, layer M – consists of data structures and a set of routines that can be invoked by higher-level layers. Layer M, in turn, can invoke operations on lower-level layers.

The main advantage of the layered approach is **simplicity of construction** and **debugging**. Each layer uses functions (operations) and services of only lower-level layers. This approach simplifies debugging and system verification. The first layer can be debugged without any concern for the rest of the system., since it uses only the basic hardware to implement its function. Once the first layer is debugged, its correct functioning can be assumed while the second layer is debugged, and so on. **If an error is found during the debugging of a particular layer, the error must be on that layer, because the layers below it are already debugged.** Thus, the **design and implementation of the system are simplified**.

- (ix) Distinguish between the **SCAN** and **C-SCAN** disk scheduling algorithms.

Answer :

Circular SCAN (C-SCAN) scheduling is a variant of SCAN designed to provide a more uniform wait time. Like SCAN, C-SCAN moves the head from one end of the disk to the other, servicing requests along the way. When the head reaches the other end, however, it immediately returns to the beginning of the disk without servicing any requests on the return trip.

SARDAR PATEL UNIVERSITY
MASTER OF COMPUTER APPLICATIONS
SEMESTER - II
SE PS02CMCA24 (Operating System Principles)
Monday 30th April, 2018

Time: 11:00 am to 2:00 pm

Max. Marks: 70

[8]

Q-1 Choose the most appropriate option for each question:

1. Which is the fastest form of memory in a computer system?
A) Cache memory B) Registers
C) Main memory D) Solid state disk
 2. Which of the following is *not* an advantage of interprocess communications?
A) Modularity B) Information sharing
C) Convenience D) None of these
 3. Which of the following is also known as the short-term scheduler?
A) CPU scheduler B) Disk scheduler
C) Swapper D) None of these
 4. Which of the following is *not* a classic problem of synchronization?
A) The bounded-buffer problem B) The dining philosophers problem
C) Multiprocessor problem D) The readers-writers problem
 5. Which of the following is *not* a memory allocation strategy for variable-sized partitions?
A) First-fit B) Best-fit
C) Worst-fit D) None of these
 6. Which of the following memory management scheme suffers from internal fragmentation?
A) Segmentation B) Variable-sized partitioning
C) Paging D) None of these
 7. Which of the following is a disk-scheduling algorithm?
A) SJF B) SSTF
C) LRU D) None of these
 8. Which of the following is *not* an advantage of a RAID structure?
A) Increased storage B) Increased reliability
C) Increased performance D) Parallel operations

O-2 Answer the following questions (Any Seven):

[14]

1. Provide any two widely accepted definitions of an operating system.
 2. Draw a figure of the storage devices hierarchy.
 3. List the advantages of multiprocessor systems.
 4. List the contents of the PCB (Process Control Block).
 5. What is a context switch? Describe what happens during a context switch.
 6. Draw a figure showing how the base and limit registers can be used to implement memory protection.
 7. List the different times at which address binding can take place.



8. Describe the LOOK algorithm.
9. List operations on files.

Q-3

- A. Draw the Gantt chart and calculate the average waiting time for the following set of processes [6] using the preemptive SJF algorithm.

Process	Arrival Time	CPU Burst Time
P1	2	5
P2	4	2
P3	6	6
P4	8	3

- B. Describe multimode operation of the CPU and its role in providing protection. Also explain [6] interrupts and their significance for the operating system.

OR

- B. Explain different types of system calls in brief. [6]

Q-4

- A. Explain the concept of and advantages of multithreading in detail with the help of figure(s). [6]
 B. Write a short note on process creation. [6]

OR

- B. Describe the critical section problem. Also explain semaphores. [6]

Q-5

- A. Explain segmentation and segmentation hardware with the help of figures. [6]
 B. Explain the conversion of logical addresses into physical addresses in a paging scheme with the help of a figure. Give a page size of 4 and a page table with entries [5, 2, 7, 1, 3], convert the logical address 13 into corresponding physical address. [6]

OR

- B. Explain disk attachment and file system mounting and unmounting. [6]

Q-6

- A. Write the Optimal page replacement algorithm. Given a memory with 3 frames and the following [6] reference string, show page replacement at each step and calculate the number of page faults.
 5, 2, 1, 0, 2, 3, 1, 0, 1, 3, 2, 5, 0, 2, 1
 B. Explain virtual memory and demand paging. [6]

OR

- B. Explain any four RAID levels. [6]

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[24]

SEAT No. _____

Total No. of printed pages : 2

SARDAR PATEL UNIVERSITY**Master of Computer Application (M.C.A.) II Semester Examination****PS02CMCA24 Operating System Principles****15th April, 2019****Time: 10:00 a.m. to 1:00 p.m.****Monday****Total Marks: 70**

- 1. Select most appropriate option for each of the following questions : 8**

- (i) Which scheduler keeps partially executed swapped out processes on a mass storage device for later execution to improve system performance ?
(A) short-term (B) medium-term (C) long-term (D) none of these.
- (ii) A list of processes that are ready to run and kept in main memory is called
(A) a ready queue (B) a device queue (C) an I/O queue (D) none of these.
- (iii) Which of the following is a CPU scheduling algorithm ?
(A) C-SCAN (B) LRU (C) RR (D) none of these.
- (iv) The Peterson's solution to the critical section problem is used for _____ concurrent processes.
(A) 2 (B) 4 (C) 8 (D) none of these.
- (v) Which approach to operating system design is best suited for debugging ?
(A) microkernel (B) modular (C) layered (D) none of these.
- (vi) Which of the following parameters can be used to compare the performance of CPU scheduling algorithms ?
(A) job size (B) average waiting time
(C) amount of time a process spends on a CPU (D) none of these.

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- 2. Answer the following questions in brief (ANY SEVEN) : 14**

- (i) Draw the **process state diagram**.
- (ii) What is a **PCB** ? Which information does it contain ?
- (iii) What is a **thread** ? List the **benefits** of multithreaded programming.
- (iv) Which **criteria** can be used to compare CPU scheduling algorithms ?
- (v) Explain the concept of a **virtual machine**.
- (vi) What is a **semaphore** ?
- (vii) Distinguish between a **process** and a **program**.
- (viii) What are the main features of the **layered design** of an operating system ?
- (ix) Distinguish between the **SCAN** and **C-SCAN** disk scheduling algorithms.

(1)

(P.T.O)

3.(A) Define the term **operating system**. List and explain various operating system services. 6

(B) Consider the following four processes, with the length of the next CPU burst given in milliseconds : 6

Process	Arrival Time	Burst Time
P1	7	9
P2	0	8
P3	8	12
P4	9	15

Show the resulting **preemptive SJF schedule** using Gantt chart.
Calculate the **average waiting time** for the resulting schedule.

OR

(B) Write a short note on **priority scheduling**. What is the major problem with priority scheduling ? What is its solution ? 6

4.(A) Explain the **queuing-diagram representation** of process scheduling. 6

(B) What is **virtual memory** ? Describe the benefits of a virtual memory system. Explain the concept of **demand paging**. 6

OR

(B) Define the term **deadlock**. List and explain the **necessary conditions** for occurrence of a deadlock. 6

5.(A) Distinguish between the **shared memory** and **message passing** models of interprocess communication. 6

(B) Write a short note on **paging scheme** for memory management. 6

OR

(B) What is a **critical section problem** ? Which **requirements** should be satisfied by a solution to the critical section problem ? 6

6.(A) Distinguish between the **FIFO** and **Optimal page replacement algorithms**. 6
Consider the following reference string :

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

Assuming **three memory frames**, find out the **total number of page faults** using the **FIFO page replacement algorithm**.

(B) Describe the **FCFS** disk scheduling algorithm. Consider an ordered **disk queue** with requests involving the following tracks :

26, 67, 36, 128, 62, 83, 72

If the read/write head is initially located on track 43, what is the **total head movement** considering the **FCFS disk scheduling algorithm** ?

OR

(B) What is a **page fault** ? Explain the steps required to handle a page fault with a diagram. 6

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SARDAR PATEL UNIVERSITY
MASTER OF COMPUTER APPLICATIONS
SEMESTER - II
COURSE PS02CMCA24 (Operating System Principles)
Monday 30th April, 2018

Time: 11:00 am to 2:00 pm**Max. Marks: 70****Q-1 Choose the most appropriate option for each question:****[8]**

1. Which is the fastest form of memory in a computer system?

A) Cache memory	B) Registers
C) Main memory	D) Solid state disk
2. Which of the following is *not* an advantage of interprocess communications?

A) Modularity	B) Information sharing
C) Convenience	D) None of these
3. Which of the following is also known as the short-term scheduler?

A) CPU scheduler	B) Disk scheduler
C) Swapper	D) None of these
4. Which of the following is *not* a classic problem of synchronization?

A) The bounded-buffer problem	B) The dining philosophers problem
C) Multiprocessor problem	D) The readers-writers problem
5. Which of the following is *not* a memory allocation strategy for variable-sized partitions?

A) First-fit	B) Best-fit
C) Worst-fit	D) None of these
6. Which of the following memory management scheme suffers from internal fragmentation?

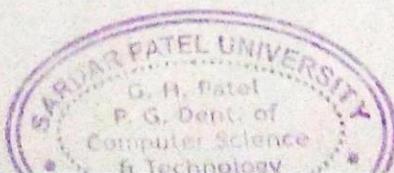
A) Segmentation	B) Variable-sized partitioning
C) Paging	D) None of these
7. Which of the following is a disk-scheduling algorithm?

A) SJF	B) SSTF
C) LRU	D) None of these
8. Which of the following is *not* an advantage of a RAID structure?

A) Increased storage	B) Increased reliability
C) Increased performance	D) Parallel operations

Q-2 Answer the following questions (Any Seven):**[14]**

1. Provide any two widely accepted definitions of an operating system.
2. Draw a figure of the storage devices hierarchy.
3. List the advantages of multiprocessor systems.
4. List the contents of the PCB (Process Control Block).
5. What is a context switch? Describe what happens during a context switch.
6. Draw a figure showing how the base and limit registers can be used to implement memory protection.
7. List the different times at which address binding can take place.



*3.(A) Define the term -
system.*

8. Describe the LOOK algorithm.
9. List operations on files.

[6]

Q-3

- A. Draw the Gantt chart and calculate the average waiting time for the following set of processes using the preemptive SJF algorithm.

Process	Arrival Time	CPU Burst Time
P1	2	5
P2	4	2
P3	6	6
P4	8	3

[6]

- B. Describe multimode operation of the CPU and its role in providing protection. Also explain interrupts and their significance for the operating system.

OR

[6]

- B. Explain different types of system calls in brief.

Q-4

- A. Explain the concept of and advantages of multithreading in detail with the help of figure(s).
B. Write a short note on process creation.

[6]

OR

[6]

- B. Describe the critical section problem. Also explain semaphores.

(B)

Q-5

- A. Explain segmentation and segmentation hardware with the help of figures.
B. Explain the conversion of logical addresses into physical addresses in a paging scheme with the help of a figure. Give a page size of 4 and a page table with entries [5, 2, 7, 1, 3], convert the logical address 13 into corresponding physical address.

OR

[6]

- B. Explain disk attachment and file system mounting and unmounting.

Q-6

- A. Write the Optimal page replacement algorithm. Given a memory with 3 frames and the following reference string, show page replacement at each step and calculate the number of page faults.
5, 2, 1, 0, 2, 3, 1, 0, 1, 3, 2, 5, 0, 2, 1
B. Explain virtual memory and demand paging.

[6]

OR

[6]

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Department of Computer Science
Sardar Patel University
M.C.A. (Third Semester) Internal Test
PS03CMCA01 Operating System Principles

Time : 1:30 Hrs

Tuesday, 6th September, 2016

Total Marks : 30

1.(A) Answer the following questions in brief (**ANY FIVE**) : 10

- (i) What is a **PCB** ? Which information does it contain ?
- (ii) Distinguish between the **shared memory** and **message passing** models of interprocess communication.
- (iii) List the **criteria** used for comparing CPU-scheduling algorithms. Define any one of them.
- (iv) Draw the **process state diagram**.
- (v) Define the term **deadlock**. Give an example.
- (vi) What are the advantages of the **layered approach** to design of an operating system ?
- (vii) What is a **critical section problem** ? Which **requirements** should be satisfied by a solution to the critical section problem ?
- (viii) What are **semaphores** ?

2.(A) Explain the four **necessary conditions** for a deadlock to occur. 5

(B) Define the term **operating system**. Write a brief note on **operating-system services**. 5

3.(A) Explain the **queueing-diagram representation** of process scheduling. 5

(B) Consider the following five processes, with the length of the next CPU burst given in milliseconds : 5

Process	Arrival Time	Burst Time
P1	4	2
P2	0	8
P3	8	13
P4	9	6
P5	2	5

Show the resulting **preemptive SJF schedule** using Gantt chart.
Calculate the **average waiting time** for the resulting schedule.

SARDAR PATEL UNIVERSITY
Master of Computer Application (M.C.A.) III Semester Examination
PS03CMCA01 Operating System Principles
2 Monday, 28th November, 2016

Time: 11:00 a.m. to 2:00 p.m.

Total Marks: 70

1. Select most appropriate option for each of the following questions : 8

- (i) Which of the following services is not provided by an operating system ?
 (A) CPU scheduling (B) disk scheduling
 (C) memory management (D) none of these.
- (ii) Which model of interprocess communication requires frequent time-consuming task of kernel intervention ?
 (A) message passing (B) shared memory (C) RPC (D) None of these.
- (iii) Which of the following is not a disk scheduling algorithm ?
 (A) C-LOOK (B) SCAN (C) SSTF (D) CSTF.
- (iv) Critical region mechanism in operating systems is used for
 (A) process synchronization (B) file management
 (C) memory management (D) none of these.
- (v) A process is ____ if it is spending more time in paging than executing.
 (A) thrashing (B) CPU bound (C) I/O bound (D) suspended.
- (vi) The interval from the time of submission of a request to the time of receiving the first response is called
 (A) response time (B) turnaround time (C) waiting time
 (D) none of these.
- (vii) Which of the following is a page-replacement algorithm ?
 (A) C-LOOK (B) SJF (C) LRU (D) None of these.
- (viii) Which of the following techniques is useful in solving indefinite blockage of low priority jobs ?
 (A) thrashing (B) aging (C) starvation (D) None of these.

2. Answer the following questions in brief (ANY SEVEN) : 14

- (i) Define the term **deadlock**. Give an example.
- (ii) Draw the **process state diagram**.
- (iii) Which **criteria** are generally used for comparing **CPU scheduling** algorithms ? Define any one of them.
- (iv) What is a **thread** ? List the **benefits** of multithreaded programming.
- (v) Distinguish between the **shared memory** and **message passing** models of interprocess communication.
- (vi) What do you mean by **wait()** and **signal()** in the context of a **semaphore** ?
- (vii) What is **Belady's anomaly** ? Which algorithm suffers from it ?
- (viii) Assume that there is only one process of 34 time units in the system. Find out the **number of context switches** that will occur, if the size of the time quantum in RR scheduling is 4 and 6 time units respectively.
- (ix) What are the advantages of the **layered approach** to design of an operating system ?

3.(A) Define the term **operating system**. List a set of operating system services. Explain the services provided for helping the user. 6

(B) Consider the following four processes, with the length of the next CPU burst given in milliseconds : 6

Process	Arrival Time	Burst Time
P1	2	6
P2	0	9
P3	3	4
P4	5	8

Show the resulting **preemptive SJF schedule** using Gantt chart.
Calculate the **average waiting time** for the resulting schedule.

OR

(B) Describe the **Round-Robin CPU scheduling** algorithm. 6

4.(A) What is **virtual memory**? Describe the benefits of a virtual memory system. Explain the concept of **demand paging**. What is pure demand paging? 6

(B) Write a short note on **segmentation**. 6

OR

(B) Explain the four **necessary conditions** for a deadlock to occur. 6

5.(A) Explain the functions of **long-term, medium-term and short-term schedulers** giving *queuing-diagram representation*. 6

(B) What is a **page fault**? Write the steps involved in **handling a page fault**. Explain them with a diagram. 6

OR

(B) What is a **critical section problem**? Which **requirements** should be satisfied by a solution to the critical section problem? Write the steps for **Peterson's solution** to the critical section problem for two processes. 6

6.(A) Distinguish between the **OPT and LRU page replacement algorithms**. 6
Consider the following reference string :

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

Assuming three memory frames, find out the **total number of page faults** using the **OPT and LRU page replacement algorithms**.

(B) Describe any two **disk scheduling** algorithms. 6

OR

(B) Write a short note on **RAID**. 6

[24]

SEAT No. _____

Total No. of printed pages : 2

SARDAR PATEL UNIVERSITY**Master of Computer Application (M.C.A.) II Semester Examination
PS02CMCA24 Operating System Principles**15th April, 2019

Monday

Time: 10:00 a.m. to 1:00 p.m.

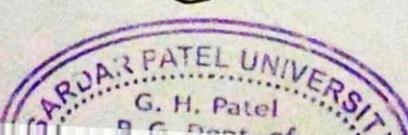
Total Marks: 70

8

1. Select most appropriate option for each of the following questions :
- Which scheduler keeps partially executed swapped out processes on a mass storage device for later execution to improve system performance ?
(A) short-term (B) medium-term (C) long-term (D) none of these.
 - A list of processes that are ready to run and kept in main memory is called
(A) a ready queue (B) a device queue (C) an I/O queue (D) none of these.
 - Which of the following is a CPU scheduling algorithm ?
(A) C-SCAN (B) LRU (C) RR (D) none of these.
 - The Peterson's solution to the critical section problem is used for _____ concurrent processes.
(A) 2 (B) 4 (C) 8 (D) none of these.
 - Which approach to operating system design is best suited for debugging ?
(A) microkernel (B) modular (C) layered (D) none of these.
 - Which of the following parameters can be used to compare the performance of CPU scheduling algorithms ?
(A) job size (B) average waiting time
(C) amount of time a process spends on a CPU (D) none of these.
 - Which of the following algorithms is also called an elevator algorithm ?
(A) SRTF (B) SJF (C) SCAN (D) none of these.
 - In which multithreading model only one thread can access a kernel at a time, and multiple threads are unable to run in parallel on multiprocessors ?
(A) one-to-one (B) many-to-one (C) many-to-many (D) none of these.
2. Answer the following questions in brief (ANY SEVEN) : 14
- Draw the process state diagram.
 - What is a PCB ? Which information does it contain ?
 - What is a thread ? List the benefits of multithreaded programming.
 - Which criteria can be used to compare CPU scheduling algorithms ?
 - Explain the concept of a virtual machine.
 - What is a semaphore ?
 - Distinguish between a process and a program.
 - What are the main features of the layered design of an operating system ?
 - Distinguish between the SCAN and C-SCAN disk scheduling algorithms.

(1)

(P.T.O)



3.(A) Define the term **operating system**. List and explain various operating system services. 6

(B) Consider the following four processes, with the length of the next CPU burst given in milliseconds : 6

Process	Arrival Time	Burst Time
P1	7	9
P2	0	8
P3	8	12
P4	9	15

Show the resulting **preemptive SJF schedule** using Gantt chart.

Calculate the **average waiting time** for the resulting schedule.

OR

(B) Write a short note on **priority scheduling**. What is the major problem with priority scheduling ? What is its solution ? 6

4.(A) Explain the **queuing-diagram representation** of process scheduling. 6

(B) What is **virtual memory** ? Describe the benefits of a virtual memory system. 6
Explain the concept of **demand paging**.

OR

(B) Define the term **deadlock**. List and explain the **necessary conditions** for occurrence of a deadlock. 6

5.(A) Distinguish between the **shared memory** and **message passing** models of interprocess communication. 6

(B) Write a short note on **paging scheme** for memory management. 6

OR

(B) What is a **critical section problem** ? Which **requirements** should be satisfied by a solution to the critical section problem ? 6

6.(A) Distinguish between the **FIFO** and **Optimal page replacement algorithms**. 6
Consider the following reference string :

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

Assuming **three memory frames**, find out the **total number of page faults** using the **FIFO page replacement algorithm**.

(B) Describe the **FCFS** disk scheduling algorithm. Consider an ordered **disk queue** with requests involving the following tracks : 6

26, 67, 36, 128, 62, 83, 72

If the read/write head is initially located on track 43, what is the **total head movement** considering the **FCFS disk scheduling algorithm** ?

OR

(B) What is a **page fault** ? Explain the steps required to handle a page fault with a diagram. 6

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SARDAR PATEL UNIVERSITY
Master of Computer Application (M.C.A.) II Semester Examination
PS02CMCA24 Operating System Principles

15th April, 2019

Monday

Time: 10:00 a.m. to 1:00 p.m.**Total Marks: 70**

8

1. **Select most appropriate option for each of the following questions :**
- (i) Which scheduler keeps partially executed swapped out processes on a mass storage device for later execution to improve system performance ?
(A) short-term (B) medium-term (C) long-term (D) none of these.
 - (ii) A list of processes that are ready to run and kept in main memory is called
(A) a ready queue (B) a device queue (C) an I/O queue (D) none of these.
 - (iii) Which of the following is a CPU scheduling algorithm ?
(A) C-SCAN (B) LRU (C) RR (D) none of these.
 - (iv) The Peterson's solution to the critical section problem is used for _____ concurrent processes.
(A) 2 (B) 4 (C) 8 (D) none of these.
 - (v) Which approach to operating system design is best suited for debugging ?
(A) microkernel (B) modular (C) layered (D) none of these.
 - (vi) Which of the following parameters can be used to compare the performance of CPU scheduling algorithms ?
(A) job size (B) average waiting time
(C) amount of time a process spends on a CPU (D) none of these.
 - (vii) Which of the following algorithms is also called an elevator algorithm ?
(A) SRTF (B) SJF (C) SCAN (D) none of these.
 - (viii) In which multithreading model only one thread can access a kernel at a time, and multiple threads are unable to run in parallel on multiprocessors ?
(A) one-to-one (B) many-to-one (C) many-to-many (D) none of these.

2. **Answer the following questions in brief (ANY SEVEN) :**
- (i) Draw the **process state diagram**.
 - (ii) What is a **PCB** ? Which information does it contain ?
 - (iii) What is a **thread** ? List the **benefits** of multithreaded programming.
 - (iv) Which **criteria** can be used to compare CPU scheduling algorithms ?
 - (v) Explain the concept of a **virtual machine**.
 - (vi) What is a **semaphore** ?
 - (vii) Distinguish between a **process** and a **program**.
 - (viii) What are the main features of the **layered design** of an operating system ?
 - (ix) Distinguish between the **SCAN** and **C-SCAN** disk scheduling algorithms.

(1)

(P.T.O)



- 3.(A) Define the term **operating system**. List and explain various operating system services. 6
- (B) Consider the following four processes, with the length of the next CPU burst given in milliseconds : 6
- | Process | Arrival Time | Burst Time |
|---------|--------------|------------|
| P1 | 7 | 9 |
| P2 | 0 | 8 |
| P3 | 8 | 12 |
| P4 | 9 | 15 |
- Show the resulting **preemptive SJF schedule** using Gantt chart.
Calculate the **average waiting time** for the resulting schedule.
- OR**
8. (B) Write a short note on **priority scheduling**. What is the major problem with priority scheduling ? What is its solution ? 6
- Q-3
A.
B.
C.
- 4.(A) Explain the **queuing-diagram representation** of process scheduling. 6
- (B) What is **virtual memory** ? Describe the benefits of a virtual memory system. Explain the concept of **demand paging**. 6
- OR**
- B.
D.
E.
- (B) Define the term **deadlock**. List and explain the **necessary conditions** for occurrence of a deadlock. 6
- Q-4
A.
B.
C.
- 5.(A) Distinguish between the **shared memory** and **message passing** models of interprocess communication. 6
- (B) Write a short note on **paging scheme** for memory management. 6
- OR**
- Q-5
A.
B.
C.
D.
E.
F.
G.
H.
I.
J.
K.
L.
M.
N.
O.
P.
Q.
- (B) What is a **critical section problem** ? Which **requirements** should be satisfied by a solution to the critical section problem ? 6
- Q-6
A.
B.
C.
D.
E.
F.
G.
H.
I.
J.
K.
L.
M.
N.
O.
P.
Q.
- 6.(A) Distinguish between the **FIFO and Optimal page replacement algorithms**. Consider the following reference string : 6
- 3, 1, 0, 1, 4, 0, 3, 0, 0, 2, 1, 5, 2, 0.
- Assuming **three memory frames**, find out the **total number of page faults** using the **FIFO page replacement algorithm**.
- (B) Describe the **FCFS disk scheduling algorithm**. Consider an ordered **disk queue** with requests involving the following tracks : 6
- 26, 67, 36, 128, 62, 83, 72
- If the read/write head is initially located on track 43, what is the **total head movement** considering the **FCFS disk scheduling algorithm** ?
- OR**
- (B) What is a **page fault** ? Explain the steps required to handle a page fault with a diagram. 6

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SARDAR PATEL UNIVERSITY
MASTER OF COMPUTER APPLICATIONS
SEMESTER - II
COURSE PS02CMCA24 (Operating System Principles)
Monday 30th April, 2018

Time: 11:00 am to 2:00 pm**Max. Marks: 70****Q-1 Choose the most appropriate option for each question:****[8]**

1. Which is the fastest form of memory in a computer system?

A) Cache memory	B) Registers
C) Main memory	D) Solid state disk
2. Which of the following is *not* an advantage of interprocess communications?

A) Modularity	B) Information sharing
C) Convenience	D) None of these
3. Which of the following is also known as the short-term scheduler?

A) CPU scheduler	B) Disk scheduler
C) Swapper	D) None of these
4. Which of the following is *not* a classic problem of synchronization?

A) The bounded-buffer problem	B) The dining philosophers problem
C) Multiprocessor problem	D) The readers-writers problem
5. Which of the following is *not* a memory allocation strategy for variable-sized partitions?

A) First-fit	B) Best-fit
C) Worst-fit	D) None of these
6. Which of the following memory management scheme suffers from internal fragmentation?

A) Segmentation	B) Variable-sized partitioning
C) Paging	D) None of these
7. Which of the following is a disk-scheduling algorithm?

A) SJF	B) SSTF
C) LRU	D) None of these
8. Which of the following is *not* an advantage of a RAID structure?

A) Increased storage	B) Increased reliability
C) Increased performance	D) Parallel operations

Q-2 Answer the following questions (Any Seven):**[14]**

1. Provide any two widely accepted definitions of an operating system.
2. Draw a figure of the storage devices hierarchy.
3. List the advantages of multiprocessor systems.
4. List the contents of the PCB (Process Control Block).
5. What is a context switch? Describe what happens during a context switch.
6. Draw a figure showing how the base and limit registers can be used to implement memory protection.
7. List the different times at which address binding can take place.



8. Describe the LOOK algorithm.
 9. List operations on files.

Q-3

- A. Draw the Gantt chart and calculate the average waiting time for the following set of processes [6]
 using the preemptive SJF algorithm.

Process	Arrival Time	CPU Burst Time
P1	2	5
P2	4	2
P3	6	6
P4	8	3

- B. Describe multimode operation of the CPU and its role in providing protection. Also explain [6]
 interrupts and their significance for the operating system.

OR

- B. Explain different types of system calls in brief. [6]

Q-4

- A. Explain the concept of and advantages of multithreading in detail with the help of figure(s). [6]
 B. Write a short note on process creation. [6]

OR

- B. Describe the critical section problem. Also explain semaphores. [6]

Q-5

- A. Explain segmentation and segmentation hardware with the help of figures. [6]
 B. Explain the conversion of logical addresses into physical addresses in a paging scheme with the [6]
 help of a figure. Give a page size of 4 and a page table with entries [5, 2, 7, 1, 3], convert the
 logical address 13 into corresponding physical address.

OR

- B. Explain disk attachment and file system mounting and unmounting. [6]

Q-6

- A. Write the Optimal page replacement algorithm. Given a memory with 3 frames and the following [6]
 reference string, show page replacement at each step and calculate the number of page faults.
 5, 2, 1, 0, 2, 3, 1, 0, 1, 3, 2, 5, 0, 2, 1
 B. Explain virtual memory and demand paging. [6]

OR

- B. Explain any four RAID levels. [6]

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3.(A) Define the term **operating system**. List and explain various operating system services. 6

(B) Consider the following four processes, with the length of the next CPU burst given in milliseconds : 6

Process	Arrival Time	Burst Time
P1	7	9
P2	0	8
P3	8	12
P4	9	15

Show the resulting **preemptive SJF schedule** using Gantt chart.

Calculate the **average waiting time** for the resulting schedule.

OR

(B) Write a short note on **priority scheduling**. What is the major problem with priority scheduling ? What is its solution ? 6

4.(A) Explain the **queuing-diagram representation** of process scheduling. 6

(B) What is **virtual memory** ? Describe the benefits of a virtual memory system. 6
Explain the concept of **demand paging**.

OR

(B) Define the term **deadlock**. List and explain the **necessary conditions** for occurrence of a deadlock. 6

5.(A) Distinguish between the **shared memory** and **message passing** models of interprocess communication. 6

(B) Write a short note on **paging scheme** for memory management. 6

OR

(B) What is a **critical section problem** ? Which **requirements** should be satisfied by a solution to the critical section problem ? 6

6.(A) Distinguish between the **FIFO** and **Optimal page replacement algorithms**. 6
Consider the following reference string :

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

Assuming **three memory frames**, find out the **total number of page faults** using the **FIFO page replacement algorithm**.

(B) Describe the **FCFS** disk scheduling algorithm. Consider an ordered **disk queue** with requests involving the following tracks : 6

26, 67, 36, 128, 62, 83, 72

If the read/write head is initially located on track 43, what is the **total head movement** considering the **FCFS disk scheduling algorithm** ?

OR

(B) What is a **page fault** ? Explain the steps required to handle a page fault with a diagram. 6

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SEAT No. _____

Total No. of printed pages : 2

SARDAR PATEL UNIVERSITY
Master of Computer Application (M.C.A.) II Semester Examination
PS02CMCA24 Operating System Principles

15th April, 2019

Monday

Total Marks: 70**Time: 10:00 a.m. to 1:00 p.m.****1. Select most appropriate option for each of the following questions : 8**

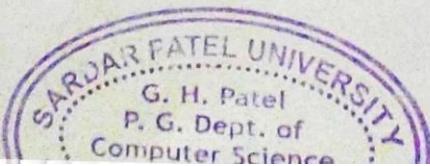
- (i) Which scheduler keeps partially executed swapped out processes on a mass storage device for later execution to improve system performance ?
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2. Answer the following questions in brief (ANY SEVEN) :**14**

- (i) Draw the process state diagram.
- (ii) What is a PCB ? Which information does it contain ?
- (iii) What is a thread ? List the benefits of multithreaded programming.
- (iv) Which criteria can be used to compare CPU scheduling algorithms ?
- (v) Explain the concept of a virtual machine.
- (vi) What is a semaphore ?
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(1)

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- 3.(A) Define the term **operating system**. List and explain various operating system services. 6

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Show the resulting **preemptive SJF schedule** using Gantt chart.
Calculate the **average waiting time** for the resulting schedule.

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- (B) Write a short note on **priority scheduling**. What is the major problem with priority scheduling ? What is its solution ? 6

- Q-3 4.(A) Explain the **queuing-diagram representation** of process scheduling. 6

- A. (B) What is **virtual memory** ? Describe the benefits of a virtual memory system. 6
B. Explain the concept of **demand paging**.

OR

- B. (B) Define the term **deadlock**. List and explain the **necessary conditions** for occurrence of a deadlock. 6

- Q-4 5.(A) Distinguish between the **shared memory** and **message passing** models of interprocess communication. 6

- B (B) Write a short note on **paging scheme** for memory management. 6

OR

- Q-5 (B) What is a **critical section problem** ? Which **requirements** should be satisfied by a solution to the critical section problem ? 6

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Q-2 Answer the following questions (Any Seven):**[14]**

1. Provide any two widely accepted definitions of an operating system.
2. Draw a figure of the storage devices hierarchy.
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7. List the different times at which address binding can take place.



8. Describe the LOOK algorithm.
 9. List operations on files.

Q-3

[6]

- A. Draw the Gantt chart and calculate the average waiting time for the following set of processes

Process	Arrival Time	CPU Burst Time
P1	2	5
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[6]

- B. Describe multimode operation of the CPU and its role in providing protection. Also explain
interrupts and their significance for the operating system.

OR

[6]

- B. Explain different types of system calls in brief.

Q-4

[6]

- A. Explain the concept of and advantages of multithreading in detail with the help of figure(s).
 B. Write a short note on process creation.

OR

[6]

- B. Describe the critical section problem. Also explain semaphores.

Q-5

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- A. Explain segmentation and segmentation hardware with the help of figures.
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help of a figure. Give a page size of 4 and a page table with entries [5, 2, 7, 1, 3], convert the
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[6]

- B. Explain disk attachment and file system mounting and unmounting.

Q-6

[6]

- A. Write the Optimal page replacement algorithm. Given a memory with 3 frames and the following
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5, 2, 1, 0, 2, 3, 1, 0, 1, 3, 2, 5, 0, 2, 1
 B. Explain virtual memory and demand paging.

[6]

OR

[6]

- B. Explain any four RAID levels.

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