Assignment : 02

Q.1 How PCB helps in process state management? Explain the structure of PCB.

→ i) When os creates process, it creates this process descriptor. In some operating systems, it called Process control block.

ii) Process control block will change according to the operating system.

iii) PCB is also called as task control block.

iv) PCB is identified by an integer Process ID (PID)

v) When the OS stops running a process, it saves the register's values in the PCB.

- Structure of PCB :-

Process identification
Priority number
Program counter
memory allocation
I/O status information
List of open files
Accounting information
Number of registers Process state

i) Process identification :-
Each process is uniquely identified by the user's identification and a pointer connecting it to its descriptor.

ii) Priority Number :-
Operating system allocates the priority number to each process.
According to the priority number it allocates the resources.

iii) Program Counter :-
The PC indicates the address of the next instruction to be executed for this current process

iv) Memory allocation :-
It contains the value of the base registers, limit registers and the page tables depending on the memory system used by the O.S.

v) I/O status information :-
It maintains information about the open files, list of I/O devices allocated to the process etc.

vi) List of open files :-
Process uses number of files for operation. Operating system keeps track of all opened files by this process.

vii) Process state :- Process may be in any one of the state: new, ready, running, waiting, terminate.

Q.2 Draw and explain Process state diagram.

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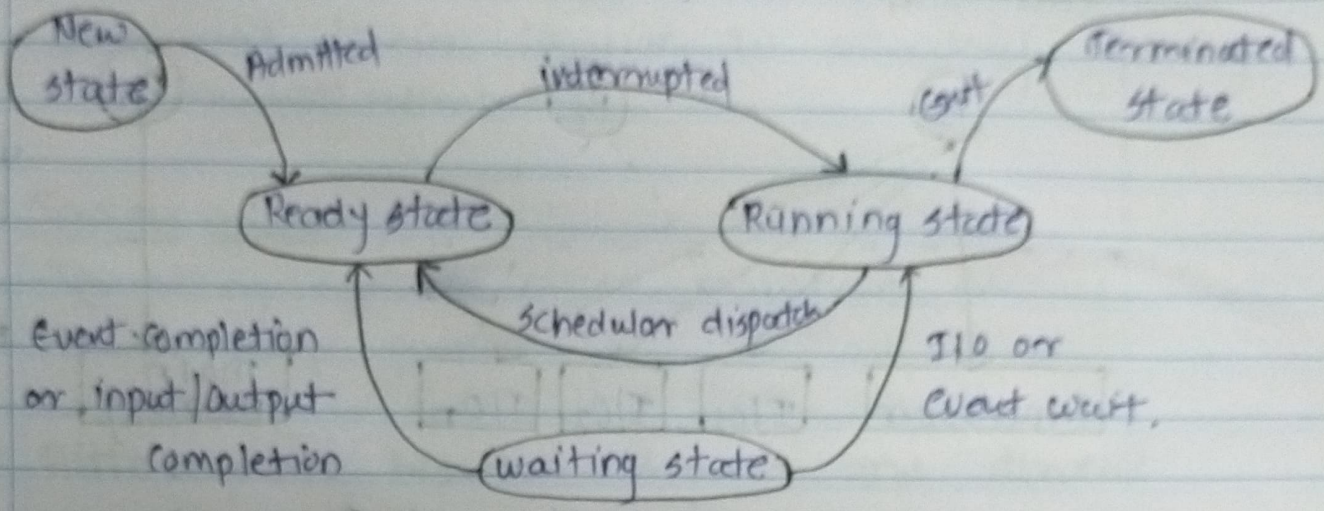


The Process states :-

i) New : Operating system creates new process by using fork() system call.

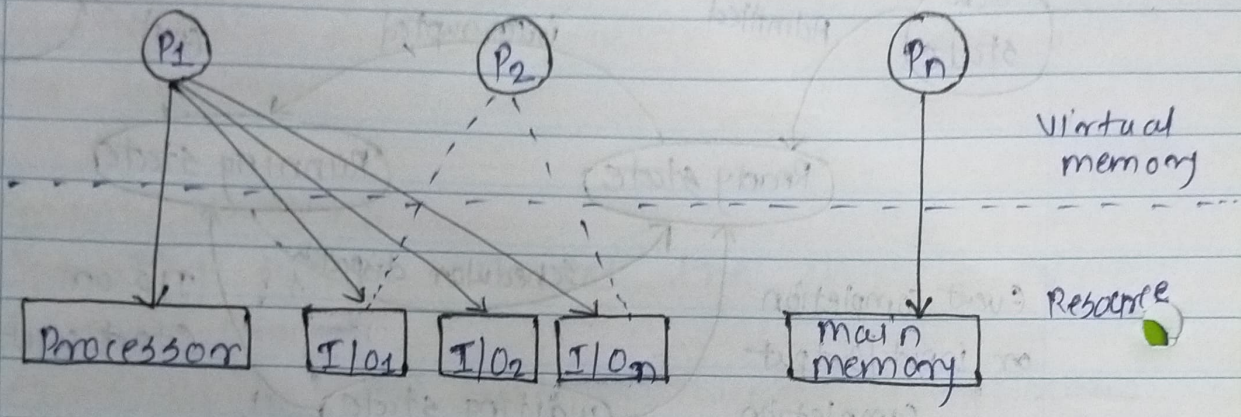
ii) Ready :-
The process is competing for the CPU. Process reaches to the head of the list (queue)

iii) Running :-
The process that is currently being executed.

iv) Waiting :-
A process is waiting until some event occurs such as the completion of an input/output operation.

v) Terminated :
A process completes its operations and releases all resources.

Q.3 Draw process state transition diagram and explain each step in it.



Process description and Resources

Operating system maintain four different table.

1) Memory table :-
i) Operating system uses memory table for keeping track of both main memory & secondary memory
ii) Following information is stored in the memory table.
a) Allocation of main memory to user interface.
b) Allocation of secondary memory to user processes
c) Protection attributes.

2) Input-output tables :-
i) This helps O.S for managing I/O devices.
ii) It contains information like:
a) Device availability
b) Status of I/O operation
c) Location of device in main memory.

3) File tables:-
It maintains information about the existence of files and their location on secondary memory with ~~example~~ attributes.

4) Process table:-
Operating system must maintain process tables to manage process.

Q. 4) Differentiate between Process and thread.

Thread	Process
i) Thread is also called as light weight process	i) Process is a sequence of instruction execution.
ii) O.S. is not required for thread switching	ii) O.S interface is required for process switching.
iii) One thread can read write or even completely clean another thread stack	iii) Each process operates independently of the other process
iv) All threads can share some set of open files and child processes	iv) In multiple processing each process execute same code but has its own memory & file resourse.

Thread	Process
v) If one thread is block & waiting then second thread in the task can run	v) If one server process is locked then other server process can't execute until the first process.
vi) Uses few resources	vi) Uses more resources

Q.5) Define thread. List and explain different thread scheduling algorithms.

→ 1) Thread :-

i) Thread is a dispatchable unit of work. It consist thread id, program counter, stack & register set.

ii) Thread is also called as light weight process because they take fewer resources then a proces

iii) The thread is easy to create and destroy.

iv) Every program has at least one thread.

2) Thread Scheduling Algorithms :-

~~Thread scheduling algorithm contains follow~~ ~~states.~~

1) ~~New~~ :- ~~Thread is just~~ created.

☆ Scheduling Algorithm:-

1) First come first serve scheduling:-

i) This method of scheduling means that the first process to request the processor gets it until it finished execution.

ii) With this algorithm, processes are assigned the CPU in the order they request it.

iii) FCFS is non-preemptive CPU scheduling algorithm

iv) This is also called First In first Out method (FIFO).

v) FCFS is simple to implement because it uses a FIFO queue.

vi) Advantages :- 1) simple to implement 2) Fair

2) Shortest Job First scheduling :-

i) Shortest Job first scheduling algorithm is also known as Shortest Job Next (SJN) scheduling algorithm.

ii) It handles the process based on length of their CPU ~~sty~~ cycle time.

iii) It reduces average waiting time over FIFO algorithm

iv) SJF is a non-preemptive CPU scheduling algorithm.

v) SJF scheduling algorithm is used frequently in long term scheduling.

vi) Preementive version of SJF is called as shortest Remaining Time Next (SRTN)

3) Priority Scheduling :-

i) Priority CPU scheduling algorithm is preemptive and non-preemptive algorithm.

ii) It is one of the most common scheduling algorithm in batch system

iii) Priority can be assigned by a system admin using characterstics of the process.

iv) In this scheduling algorithm, CPU select higher priority process first.

v) The priority of a process determines how quickly its request for a CPU will be granted if other process make competing requests

4) Round Robin scheduling :-

i) Round robin is a preemptive scheduling algorithm.

ii) It is use in interactive system.

iii) use of small time contains allows the Round robin to good response time

iv) Ready queue is maintain as FIFO of the proces

Q.6 Differentiate between User level thread and kernel level thread.

→

User level threads	Kernel level threads
i) User level threads are faster to create and manage	i) Kernel level threads are slower to create and manage.
ii) Implemented by a thread library at user level	ii) Operating system support directly to kernel threads.
iii) It can run on any operating system.	iii) They are specific to the operating system.
iv) Support provide at the user level called user level thread	iv) Support may be provided by kernel is called kernel level threads
v) Multithread application cannot take advantage of multiprocessing	v) Kernel routines themselves can be multithreaded.
vi) User level threads are also called many to one mapping thread	vi) Kernel level thread suppor one to one thread mappin
vii) Example: POSIX Pthreads and mach C-threadds	vii) Kernel level thread support one to one thread mapping

Q.7) Explain different type of scheduler in operat system.

→ Different type of schedulers are as follow:

1) Long term scheduler:

i) Long term scheduler is also called as job scheduler

ii) It determines which process are admitted to system for processing.

iii) Processes are selected from the queue and loa into the main memory for execution.

iv) It controls the degree of multiprogramming in multitasking systems.

2) Medium term scheduler:

i) Medium term scheduler is part of swapping function.

ii) It reduces the degree of multiprogramming

iii) If process makes an I/O request & it is in memo then operating system takes this process into suspended states.

3) Short term scheduler :-

i) Short term scheduler is also called CPU scheduler.

ii) It selects the process from queue which are ready to execute.

iii) Short term scheduler is faster then long term scheduler.

iv) This scheduler makes scheduling decisions much more frequently than the long-term or mid-term schedulers.

Q. 8) Specify the role of long term and medium term scheduler in O.S. with neat diagram.

→ 1) Role of Long term scheduler and medium term scheduler.

i) Schedulers are used to handles process scheduling.

ii) It is one type of system software and selects the jobs from the system and decide which process to run.

iii) Schedulers are of three types.
1) Long term scheduler
2) Medium term scheduler
3) Short term scheduler.

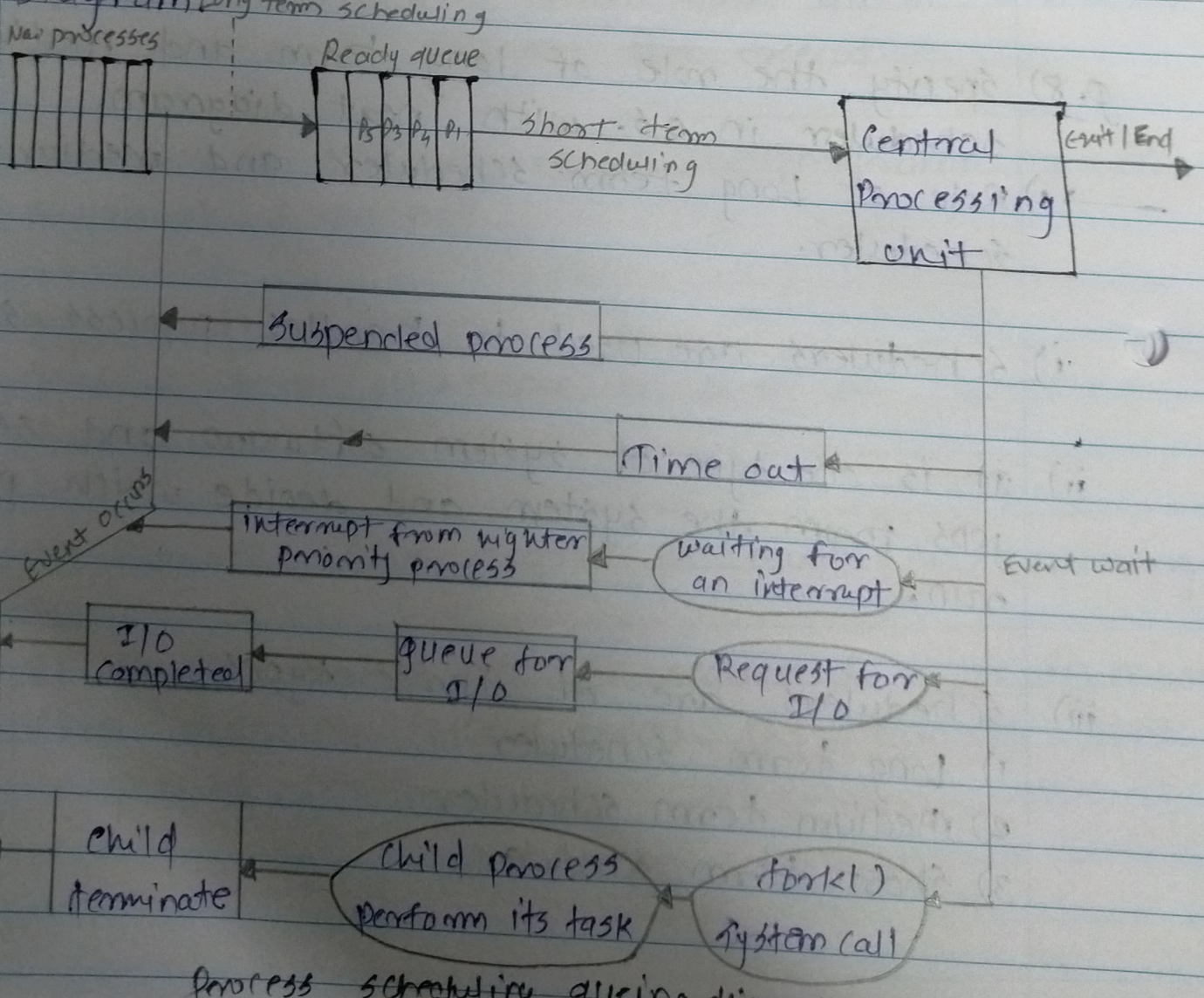
iv) Long term scheduler determines which process are admitted to the system for scheduling.

v) Long term scheduling controls the degree of multiprogramming in multitasking system.

vi) medium term scheduler is the part of swapping function. Sometimes it removes the process from memory

vii) medium term scheduler reduces the degree of multiprogramming

viii) Diagram



Process scheduling queing diagram.

Q.9. Explain the concept of context switch with neat diagram.

→ i) Context switch :-

i) A context switch is the switching of the CPU from one process or thread to another.

ii) A context is the contents of the CPU's registers and program counter at any point in time.

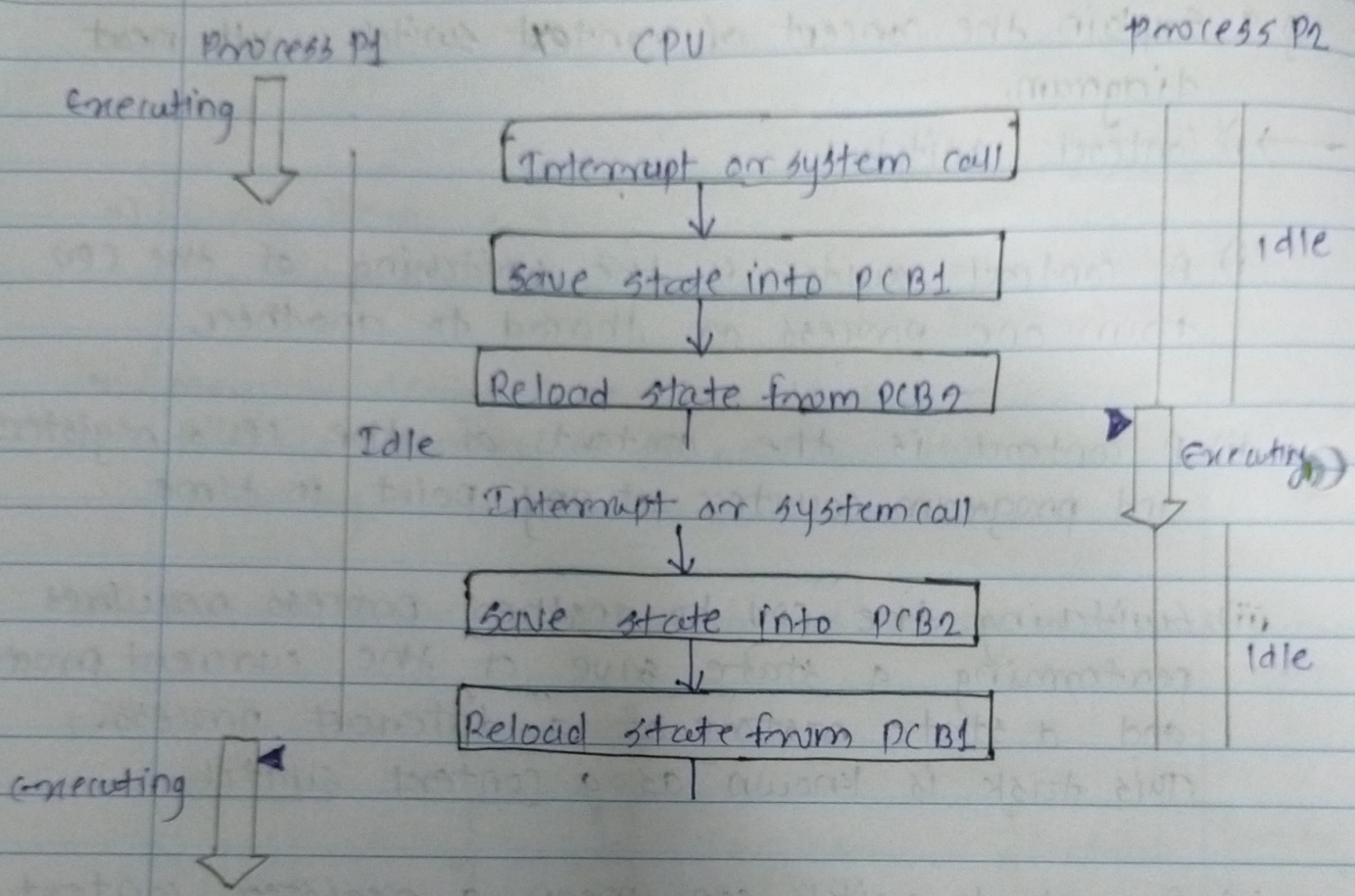
iii) Switching the CPU to another process requires performing a state save of the current process and a state restore of a different process. This task is known as a context switch.

iv) A context switch can mean a register context switch, a task context switch, a thread context switch or process context switch.

v) Context switches can occur only in kernel mode (system mode).

vi) Context switch time are highly dependent on hardware support.

vii) There are three situations where a context switch needs to occure, They are :-
1) multitasking
2) interrupt handling
3) user & kernel mode switching.


Process P1
CPU
Process P2
Executing
Interrupt or system call
Save state into PCB1
Idle
Reload state from PCB2
Executing
Idle
Interrupt or system call
Save state into PCB2
Idle
Reload state from PCB1
Executing

Q.10 Explain CPU scheduling and CPU scheduling Criteria.

*1) CPU scheduling :-

i) In multiprogramming environment, usually more programs to be executed than could possibly be run time at one time.

ii) In CPU scheduling it switches from one process to another process. CPU resource management is commonly known as scheduling.

iii) Objective of the multiprogramming is to increase the CPU utilization.

iv) CPU scheduling is one kind of fundamental operating system functions.

*2) CPU scheduling Criteria :-

Depending on the system, CPU scheduling criteria will change.

1) Throughput :-
CPU scheduling should attempt to service the maximum number of processes per unit time.

2) Waiting time :-
The average period of time a process spends waiting.

3) Turnaround time:
Turnaround time start from process spends waiting submission to completion of process.
Turnaround time = Burst time + waiting time.

4) Response time:
It is the time from the submission of a request until the first response is produced.

5) CPU utilization:
It is average function of time during which the processor is busy

6) Fairness:
Avoid the process from the starvation.
All the processes must be given equal opportunity to execute.

7) Priority:
If is the operating system assigns priorities to processes, the scheduling mechanism should favor the higher priority processes.

8) Predictability:
A given process always should run in about the same amount of time under similar system loads.