OS Paper Solution KCS-401

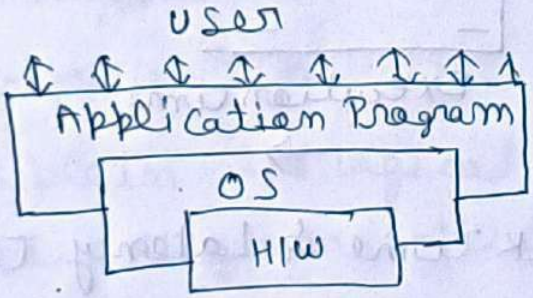
OS Paper

Section-A

Q→1(a) Define OS and mention its major functions.

Ans→1(a) It is a software that provide an interface between User and Hardware.
It provide an platform to execute application program (software).
It is a system software and act as a resource manager.

* Abstract view of OS



main function → (a) File management
(b) I/O device management
(c) Memory management
(d) Processor management.

Q→1(b) Briefly define the term Real time OS.

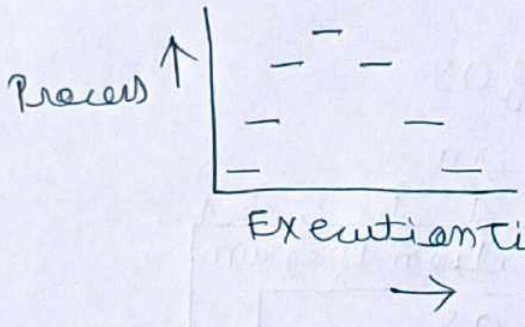
Ans→1(b) It is a type of OS in which the primary objective is to provide quick Response time and secondary objective is User Convience

Ex:- Rocket launching, telephone switching equipments etc.

* Category of Real time OS → (a) Soft Real time OS.
(b) Hard Real time OS.

Q → 1(c) What do you mean by Concurrent Processes?

Ans → 1(c) Concurrent Process is a computing model in which multiple processor may progress the instruction simultaneously but not executed simultaneously. It provide High efficiency for computing system. It is faster for multiple task



Q → 1(d) Define Seek Time & Latency Time?

Ans → 1(d) ST → The time which is required to Search a track

LT → The time taken by the disk between request for data & return of the data.

Q → 1(e) Why do we need Scheduling?

Ans → 1(e) Process scheduling or CPU scheduling or I/O scheduling that allow the OS to ~~allocate~~ make every time busy. So that CPU utilization will be increase, Degree of multiprogramming increase

& Less Response time.

* Scheduling criteria.

(a) CPU utilization.
(b) waiting time
(c) Turn around time.
(d) Response time.
(e) Throughput.

Q → 1(f) what are the Performance criteria in CPU Scheduling?

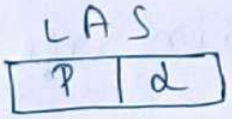
Ans → 1(f) ⇒ There are the following Performance criteria in CPU Scheduling.

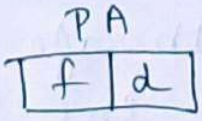
(a) CPU utilization.
(b) waiting time.
(c) Turn around time.
(d) Response time.
(e) Throughput
(f) Completion time.

Q → 1(g) ⇒ Explain the logical address space & Physical address space diagrammatically.

Ans → 1(g) ⇒ LAS → The address which is generated by CPU. The set of logical address is called LAS.

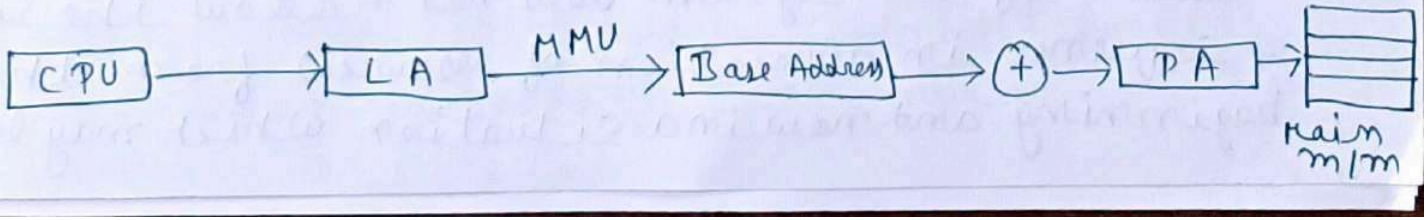
PAS → The address which are present in main memory is called PA. The set of Physical Address is called PAS





P → Page
f → frame
d → off set

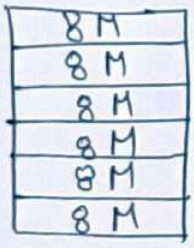
or



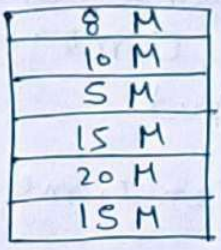
Q → 1(h) Explain in brief about the Multiprogramming with fixed partitions?

Ans → 1(h) In this method, Divide the memory in fixed size. These partitions can be of different size but once the process taken a certain size. then, it remains at that size, There is no provisions for changing their size. This is called multiprogramming with Fixed partitions.

* There are two ways of Fixed partitions
  (i) Equal size partition.
  (ii) Unequal size partition.



Equal size Partition



Unequal size Partition

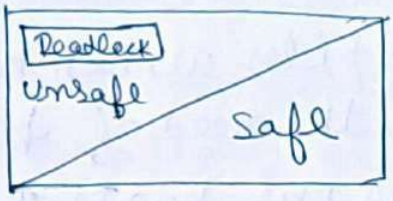
Q → 1(i) What do you mean by Safe state & Unsafe state?

Ans → 1(i) SS → when the system allocate the resources to each process in same order and still avoide the deadlock condition.

A system with Safe State Contain Safe sequence [P1, P2 - - - - Pn]

US → If the system does not follow the Safe sequence in allocation of resources from the beginning and now in a situation which may lead

to a deadlock condition or chances of deadlock is higher.



Q→1(j) what do you mean by I/O Buffering?

Ans→1(j) first of all we discuss, Buffer is a temporary memory storage that store the data b/w two devices.

Buffering is done to overcome the speed mismatch b/w I/O & CPU. In which the required data is already stored in buffer storage which lead to increase the performance of the system.

~~Types of I/O Buffering~~

Section-B

Question 2(a) → Explain in detail about File system Protection and Security.

Ans→2(a) ⇒ Protection in File System

In computer systems, alot of User's information is stored, the objective of the OS is to keep safe the data of the user from the improper access to the system. Protection can be provided in number of ways.

For a single laptop system, we might provide protection by locking the computer in a desk drawer or File Cabinet.

For a multiuser systems, different mechanism are used for the protection.

* Types of Access → The files which have direct access of any user have the need of protection. The mechanism of the protection provide the facility of the controlled access by just limiting the types of access to the file. Several different types of operation can be controlled.

(a) Read - Reading from a file.
(b) Write - writing or rewriting the file.
(c) Execute - loading the file & after loading the execution process start
(d) Append - writing the new information to the already existing file.
(e) Delete → Delete the file which is no use & using its space for the another data.
(f) List → List the name & attribute of the file.

* Access Control → There are different methods used by different users to access any file. The general way of protection is to associate identity - dependent access with all the files and directories an called Access control List (ACL) To condense the length of the ACL, many systems recognize three classification of users in connection with each file.

(a) Owner → Owner is the User who has created the file.

(b) Group → A Group is a set of member who has ~~created the list~~ · similar needs and they are sharing the same File.

(c) Universe → In the system, all other users are under the category called Universe.

* Security → There are following ways to provide Security are :

(a) Authentication ⇒ This deals with 'identifying each user in the system and making sure they are who they claim to be.

The different ways to make sure that the user are authentic are :

(i) Username / Password.

(ii) User key / User card.

(iii) User Attribute identification.

(b) One Time Password (OTP) ⇒ These Passwords provide a lot of security for authentication purposes. A OTP can be generated exclusively for a login every time a user wants to enter the system.

The various ways a OTP can be implemented are :

(i) Random Numbers.

(ii) Secret Key.

(c) Install Anti Virus Software.

(d) Install Anti malware software.

Q → 2(b) Explain in detail about mutual Exclusion (ME) & critical section (CS) Problem

Ans → 2(b) Mutual Exclusion ⇒ It is a requirement of CS Problem. At any time, atmost one of the process must be enter in CS.

ME is a property of process synchronization in which no two process can enter in CS at any time. The term was first coined by Dijkstra. Any process synchronization technique being used must satisfy the property of ME, without which it would not be possible to get rid of a race condition.

Critical section Problem ⇒ Critical section is a piece of code which is access by more than one concurrently.

* A CS will terminate in fixed time and a process will have to wait a fix time to enter in critical section.
* Same Entry section & Exit section are used in CS to ensure that exclusive use of CS.

```
do
{
    entry section.
    critical section
    exit section
    Remainder code
}
```

* CS Problem Like → (a) Producer Consumer Problem.
  (b) Reader writer Problem.
  (c) Dinning Philosopher's Problem.

* CS Problem soln
* Dekker's Algo ↙

For P0

```
Flag [0] = T
while (Flag [1] == T);
{ if (turn == 1)
  { Flag [0] = F
  while (turn == 1):
      Flag [0] = T
  }
}
    CS
  turn = 1
Flag [0] = F
Remainder Section
```

For P1

```
Flag [1] = T
while ( Flag [0] == T);
{
  if (turn == 0)
  {
    Flag [1] = F
  while (turn == 0);
    Flag [1] = T
  }
}
    CS
  turn = 0
Flag [1] = F
Remainder Section.
```

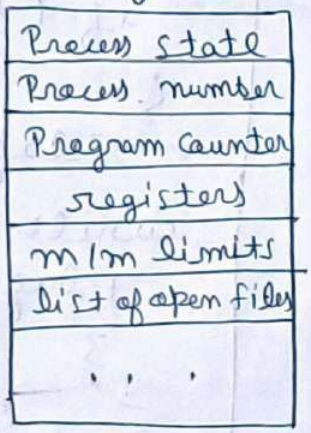
Question 2(c) Explain in detail about the PCB in CPU Scheduling

Ans → 2(c) ⇒ **PCB** → It stand for Program Control Block. When a User start application program then, the OS high level scheduler locate the part of program from secondary storage to memory, then it create a data structure in m/m is called PCB

* It contain sufficient information in PCB so that it is possible to interrupt a running process and later resume the execution.

* PCB Contain may information such as :-

(a) Process state.
(b) Accounting information.
(c) CPU scheduling.
(d) CPU register
(e) MM Management
(f) Program Counter (PC)
(g) I/O status information.



PCB

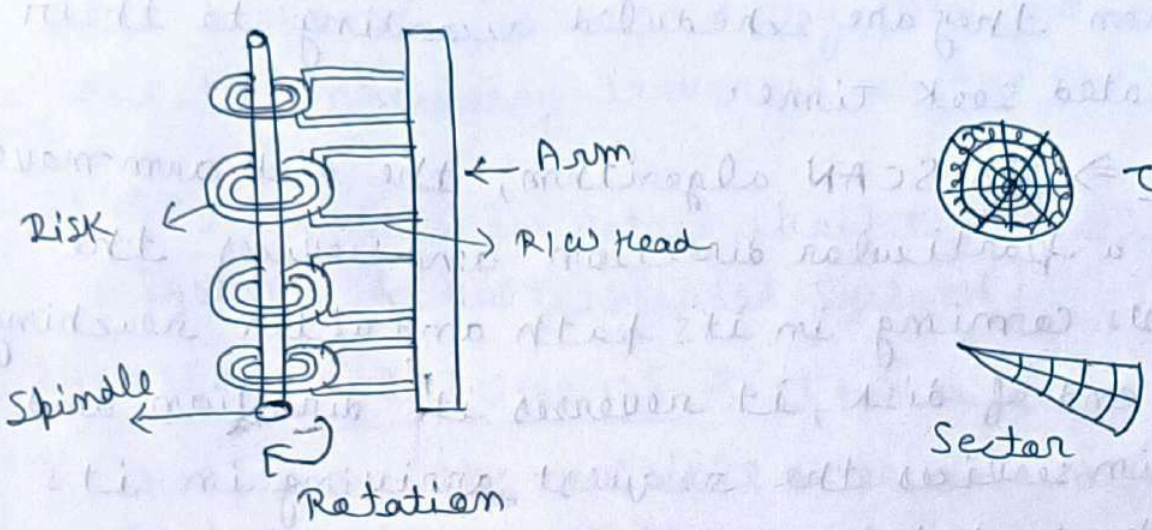
Q → 2(d) Explain in detail about the Disk storage & Disk scheduling ?

Ans → 2(d) Disk storage ⇒ It is also known as Drive storage. It is a general Category of storage mechanisms where data is recorded by various electronic, magnetic, optical or mechanical changes to a surface layer of one or more rotating disks.

* different types of Disk storage devices are :-

(a) Floppy disk.
(b) Solid-state drive.
(c) USB flash drive

(d) DUD



* Disk Scheduling ⇒ It is also known as I/O scheduling. It is done by OS to schedule the I/O requests arriving for the disk.

Disk scheduling is imp. because:-

* Multiple I/O requests may arrive by different processes and only one I/O request can be served at a time by the Disk Controller. Thus other I/O requests need to wait in the waiting queue and need to be scheduled.
* Two or more request may be far from each other can result in greater disk arm movement.

→ Types of DS → (a) FCFS ⇒ It is the simplest form of all scheduling algorithm.
In this case, the request are addressed in the order they arrive in the disk queue.

(b) SSTF → It stand for Shortest Seek Time First: It requests having shortest seek time are executed first. So the seek time of every

request is calculated in advance in the queue and then they are scheduled according to their calculated seek time.

(3) SCAN ⇒ In SCAN algorithm, the disk arm move into a particular direction and services the requests coming in its path and after reaching the end of disk, it reverses its direction and again services the request arriving in its path. So this algorithm work as a elvator and hence also known as elvaelvator algorithm.

(4) C-SCAN ⇒ In C-SCAN algorithm, the disk arm again scan the path that has been scaned after reversing its direction. So it may be possible that too many requests are waiting at the other end or there may be zero or few requests pending at the scanned area.

(5) LOOK ⇒ It is similar to SCAN disk scheduling algorithm except for the difference that the disk arm in spite of going to the end of disk goes only to the last request to be serviced in front of the head and then reverses its direction from there only. Thus it prevents the extra delay which occured due to unnecessary traversal to the end of disk.

(6) C-LOOK ⇒ C LOOK is similar to C SCAN Disk scheduling, the disk arm inspite of going to the end goes only to the last request to be serviced in front of the head and then from there

goes to the other end's last request. Thus, it also prevents the extra delay which occured due to unnecessary traversal to the end of disk.

Q→2(e) Explain in detail about the multiuser Systems & Multithreaded Systems?

Ans→2(e) Multi User OS ⇒ It is a type of OS that allow the multiple User on a different Computer to access the single system with one OS on it. This OS must ensured that the resources of different User must be balanced & seperate. So that problem of one User does not affect the other User.

Ex:- Main Frame OS, UNIX, LINUX etc.

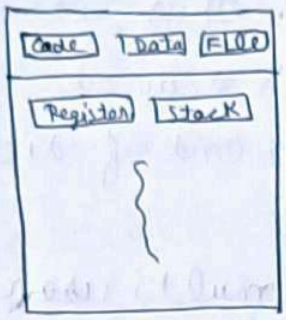
* Multithread OS ⇒ Multithread is the ability of OS to enable more than one User at a time without requiring multiple copies of the program running on the Computer.

Thread is a light weight process and it is the basic unit of sub process.

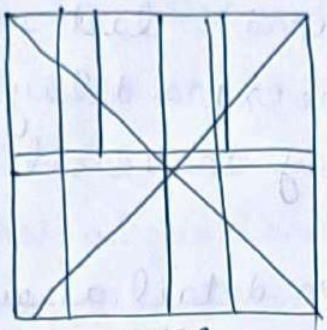
It is consist of thread ID, program Counter(PC), Register & stack.

It is sharing between the thread of similar process.

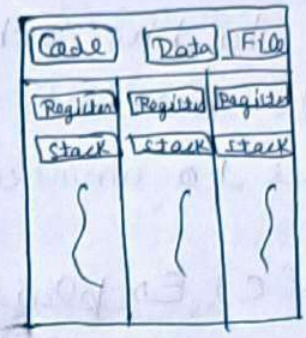
A traditional process have single thread of control but if the process have multiple thread, then it can do more than one task at the same time through parallelism.



Single Thread Process



wrong



multi thread Process.

* Advantage → (1) They share resources.
(2) They share memory.
(3) It is light weight.
(4) Context switching becomes easy.

Section-C

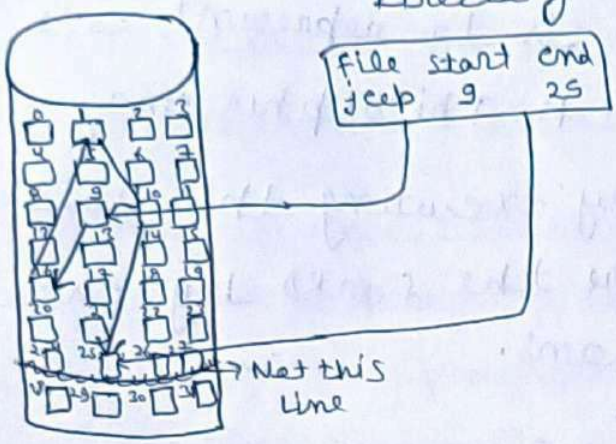
Q → 3(a) write short notes on following.

(i) File system protection and Security.

Ans → Ans will be same as 2(a)

(ii) Linked File allocation method ⇒

In this scheme, each file in a linked list of disk blocks which need not be contiguous The disk blocks can be scattered anywhere on the disk. The directory entry contains a pointer to the starting and the ending file block. Each block contains a pointer to the next block occupied by the file.



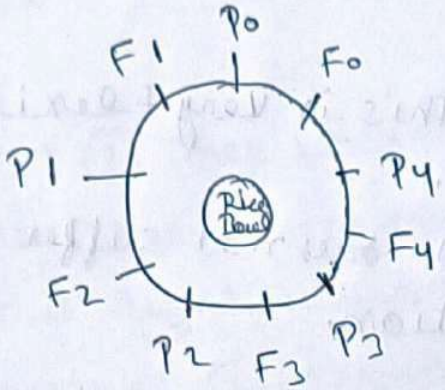
* Advantages → (a) This is very flexible in terms of file size.
(b) This method does not suffer from external fragmentation.

* Disadvantages → (a) It does not support random or direct access.
(b) Pointer required in the linked allocation incur same extra overhead.

Q → 3(b) Explain in detail about Dinning Philosopher Problem?

Ans → 3(b) Consider the five Philosopher who spent their time in thinking and eating. the Philosopher share a common circle table surrounded by 5 chair on which centre of table is a bowl of rice and 5 ~~chopstick~~ forks.
When the Philosopher is hungry and try to pickup the two forks which are closest to him. A Philosopher may pick up only one forks at a time. obviously he can not pickup the forks that is already in hand of Neighbour

One Simple Solution is to represent each forks by Semaphore. A Philosopher may try to grab the forks by executing the wait operation and when release the forks by executing the signal operations.



Solution → Philosopher (i)

```
{
    wait (chopstick [i])
    wait (chopstick [i+1] % 5)
    Philosopher is eating
    signal (chopstick [i+1] % 5)
    signal (chopstick [i])
    Philosopher is Thinking
}
```

* Dead Lock Condition → When each Philosopher hold the one Fork at the left Hand (their index no.) but when they are try to pickup Right Fork which is already in Neighbour hand.

P0 → F0
P1 → F1
P2 → F2
P3 → F3
P4 → F4.

Q → 4(a) Explain in detail about the OS services

Ans → 4(a) There are following services of OS are :-

(a) Program execution ⇒ The OS must be able to load a program into the memory for its execution. The program must compute its execution either normally or indicating some errors.

(b) Input/Output operation ⇒ A running programs may require I/O operations that may involve a file or an Input/Output device. User can not directly control I/O devices in the absence of OS for efficiency & the protection

(c) File System Manipulation ⇒ In the file system, programs are needed to read/write, update, print and delete files by name.

(d) Communication ⇒ Communication can occur in two major ways :-

(i) The first take place b/w the process running on a same computer.

(ii) Second takes place b/w the process running on the different computer that are linked together over a N/w.

(e) Error Detection ⇒ The OS constantly needs to be aware of possible errors. Errors may occur in CPU, memory, I/O devices, in user program and system programs. For each type of error, the

OS should take the proper action to ensure correct and consistent computing.

(f) Resource allocation ⇒ when there are multiple user or multiple jobs running at same time, resources must be allocates to each of them. Many different types of resources such as CPU Cycle, main mem & I/O devices manage by the OS.

(g) Accounting, Protection & Security ⇒

→ Accounting is required by the OS to keep the track of which User use how many and which kind of Computer resources.

→ when the several disjoint process execute concurrently in a system, it should not be possible for one process to interfere with the other or with this OS itself so that protection is required to ensure the control access to the computer resources.

→ Security of a system from unauthorised user is also an imp. service provide by an OS. Such security starts with each user having authenticate himself to the system.