

Roll No:

MCA (Second Year) Examination 2005
FIRST PAPER
PRINCIPLES OF OPERATING SYSTEM

Time: Three hours

Maximum Marks: 80

NOTE: Answer **Five** Questions in all, *including Question No.1*, which is compulsory.

Figures on the right-hand side margin indicate Max. Marks for each Question.

Answers should be brief and to the point and may be supplemented with neat Sketches.

1. Answer all the parts:

(05 X 04 =20)

- (a) Define the Terms: Process Switch & Context Switch? How are they related?
- (b) A Computer System has 36-bit Virtual Address Space with a Page Size of 8 K and each page table entry of 4 Bytes. What will be number of pages in Virtual Address Space? What is the maximum size of addressable Physical Memory?
- (c) How can mutually exclusive access of Critical Sections be achieved using Interrupt Disabling Mechanism? Can this scheme be used with Multiprocessor Systems?
- (d) What are the necessary conditions for deadlock to occur in a computer system? 'A cycle in wait-for-graph is necessary and sufficient condition for deadlock to occur'. Comment.
- (e) What are Foreground and Background Processes in UNIX? What does the following C Program do:

```
main()
{ int pid, ppid;
  pid=getpid();
  ppid=getppid();
  printf("process id=%d parent id =%d", pid, ppid);
}
```

2. (a) Giving the notion of Process & Process states briefly explain the Process State Transitions with the help of a neat diagram. (7)

(b) What are the criteria used for comparing various scheduling algorithms? Compute the Average Waiting & Turnaround times for the following, if *Shortest Remaining Time First* Scheduling Algorithm is used: (8)

<u>Process</u>	<u>Arrival Time</u>	<u>Burst Time</u>
P1	0	8
P2	1	4
P3	2	9
P4	3	5

3. (a) Compare Fixed Partition Scheme to Dynamic Partition Scheme of memory management. (7)
Can compaction be used with Compile Time and Load Time Bindings?

(b) Define the notion of Logical & Physical Addresses. How is Logical Address translated to Physical Address in Paging? Explain with a neat diagram. (8)

4. (a) Consider the following page reference string: (7)

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

How many page faults will occur for the FIFO page replacement algorithms, assuming three frames? Does the page fault rate always decreases with increasing number of frames?

(b) What is a Semaphore? Explain how it can be used to solve Finite Buffer Producer Consumer problem. (8)

5. (a) Explain why *wait* and *signal* operations on semaphores need to be atomic. Differentiate between strong and weak Semaphores. Which one of these guarantee freedom from starvation? (7)

(b) Distinguish between Deadlock Prevention & Deadlock Avoidance. How can a computing system recover from Deadlock, if one is known to exist? (8)

6. (a) Consider a UNIX Inode having 15 pointers, out of which 12 are pointers to direct blocks and remaining to indirect blocks, with 13th for single indirection , 14th for double indirection & the 15th for triple indirection. Assume block size of 1 KB and each address of 2 Bytes. What can be the maximum size of a File? (7)

(b) What Delay elements are involved in Disk read & write? Consider a disk queue with requests for I/O to blocks on following Cylinders: (8)

98, 183, 37, 122, 14, 124, 65, 67

in that order. If the head is initially at cylinder 53, what will be the total head movement in serving all the requests, if *Shortest Seek Time First* scheduling algorithm is used?

7. Write short notes on any two of the following: (7.5 X 2 = 15)

(a) Batch Processing & Multiprogramming.

(b) Process Control Block.

(c) File Allocation Methods.

(d) Operating System Structure.