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)**

Process	Arrival Time	Burst Time
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. Can compaction be used with Compile Time and Load Time Bindings? **(7)**

(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 13^{th} for single indirection , 14^{th} for double indirection & the 15^{th} 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 <u>any two</u> of the following: (**7.5 X 2 = 15**)

(a) Batch Processing & Multiprogramming.

(b) Process Control Block.

(c) File Allocation Methods.

(d) Operating System Structure.