Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS / M.Tech(CSE) / SEM-1 / PGCS-104 / 2009-10

2009

OPERATING SYSTEM

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *seven* questions. 7 × 10 = 70

1. Answer any *five* questions : 5 × 2 = 10

   a) Is a non-pre-emptive scheduling algorithm a good choice for an interactive system ? Briefly explain.

   b) In what way is shortest-job-first scheduling just a particular form of priority scheduling ?

   c) Round-Robin scheduling behaves differently depending on its time quantum. Can the time quantum be set to make round-robin behave the same as any of the following algorithms ? If so, how ?

      i) First-come first-served

      ii) Shortest job first.

   d) On a system with n CPUs, what is the maximum number of processes that can be in the ready, run and blocked states ?

e) On a simple paging system with 2^{24} bytes of physical memory, 256 pages of logical memory and a page size of 2^{10} bytes, how many bytes are in a page frame ?

f) What is the principal disadvantage of too much multiprogramming ?

2. a) What are the three criteria to be satisfied to design a protocol to solve critical section problem ? 3

b) Write a solution for Readers Writers Problem. 7

3. a) What do you mean by external and internal fragmentations ? 4

b) How is logical address translated to physical address in paging scheme ? 6

4. a) Explain in brief the process state transition diagram. 4

b) What are the differences between user level thread and kernel supported thread ? 4

c) What is the function of CPU-scheduler ? 2

5. Given references to the following pages by a program :

0, 3, 0, 1, 8, 1, 8, 7, 8, 7, 1, 2, 8, 2, 7, 8

How many page faults will occur if the program has three page frames available to it and uses the following ? 10

a) FIFO Algorithm

b) LRU Algorithm

c) Optimal Algorithm.

6. a) Consider the following snapshot of a system :

	Allocation				***Max***				***Available***			
	A	*B*	*C*	*D*	*A*	*B*	*C*	*D*	*A*	*B*	*C*	*D*
P_0	0	0	1	2	0	0	1	2	1	5	2	0
P_1	1	0	0	0	1	7	5	0				
P_2	1	3	5	4	2	3	5	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

Answer the following questions using the banker's algorithm :

i) What is the content of the matrix need ?

ii) Is the system in a safe state ?

iii) If a request from process P_1 arrives for (0, 4, 2, 0) can the request be granted immediately ? 2 + 3 + 2

b) Explain the circular wait condition for deadlock. 3

7. For the processes listed below, draw Gantt chart and calculate average waiting time and average turn-around-time :

Process	***Arrival time***	***Burst time***
A	0·000	3
B	1·001	6
C	4·001	4
D	6·001	2

using :

a) FCFS

b) Shortest job first (pre-emptive)

c) Shortest job first (non-pre-emptive)

d) Round-Robin. $4 \times 2\frac{1}{2}$

8. What is monitor ? Write a solution for Dining Philosopher's problem. 3 + 7

9. a) Assume that the amount of memory on a system is inversely proportional to the page fault rate. Each time memory doubles, the page fault rate is cut in half. Currently the system has 32 Mb of memory. When a page fault occurs, the average access time is 1 ms, 1 μs otherwise. Overall, the effective access time is 300 μs. How much additional memory would be needed to cut the effective access time to 100 μs ? Assume that the total memory in the system must be a power of 2. 6

   b) Explain in brief demand paging. 4

10. Write short notes on any *two* of the following : 2 × 5

   a) Swapping

   b) Realtime systems

   c) Thrashing

   d) Segmentation.