Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CSE/IT)/SEM-5/CS-501/2009-10

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.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : 10 × 1 = 10

i) If a process has 32 k bytes logical address space and the page size is 2048 bytes then the number of frames of that process is

a) 4 b) 8

c) 16 d) 32.

ii) What is a shell ?

a) It is a hardware component

b) It is a command interpreter

c) It is a part in compiler

d) It is a tool in CPU scheduling.

iii) Variable partition memory allocation can lead to

a) external fragmentation

b) internal fragmentation

c) both (a) and (b)

d) none of these.

iv) Suppose that a process is in BLOCKED state waiting for some I/O service. When the service is completed, it goes to the

a) RUNNING state b) READY state

c) SUSPENDED state d) TERMINATED state.

v) IPC stands for

a) Internal Program Controller

b) Internal Process Control

c) Interprocess Communication

d) None of these.

vi) SPOOLING stands for

a) Spontaneous Peripheral Operation Online

b) Small Peripheral Operation Online

c) Simultaneous Peripheral Operation Online

d) None of these.

vii) Page fault occurs when

a) the page in corrupted by application software

b) the page is not in main memory

c) the page is in main memory

d) one tries to divide a number by 0.

viii) Page stealing is

a) a sign of efficient system

b) taking larger disk spaces for pages paged out

c) taking page frames from other working sets

d) one of the tuning goals.

ix) The general structure of a process consists of

a) critical section b) reminder section

c) race condition d) both (a) and (b).

x) Scheduling a process from Ready Queue to CPU is done by

a) Short Term Scheduler

b) Middle Term Scheduler

c) Long Term Scheduler

d) Dispatcher.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) What is "response time" ?

b) With the help of a state transition diagram, explain various states of a process.

c) What is a zombie process and how it may manifest itself ? 1 + 2 + 2

3. Suppose a disk drive has 300 cylinders, numbered 0 to 229. The current head position of the disk is at 90. The queue of pending requests, in FIFO order is 36, 79, 15, 120, 199, 270, 89, 170.

Calculate the average cylinder movements for Shortest Seek Time First (SSTF) algorithm. Mention any one disadvantage of SSTF. 3 + 2

4. a) Describe process control block with proper explanation.
   b) What is the purpose of system calls ? 3 + 2
5. a) Mention one characteristic each of Time Sharing System and Batch Processing System.
   b) What are the advantages and disadvantages of having unequal size partitions in fixed partitioning scheme ? 2 + 3
6. a) Why are page sizes always powers of 2 ?
   b) What is the difference between logical and physical addresses ? 2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Consider the following snapshot of a system where r_i (i = 1··4) denote resource types and P_1 to P_5 denote processes. The vector 'Available' has usual meaning.

Available :

*r*1	*r*2	*r*3	*r*4
2	1	0	0

	Current allocation :				*maximum demand :*			
Process	*r*1	*r*2	*r*3	*r*4	*r*1	*r*2	*r*3	*r*4
P1	0	0	1	2	0	0	1	2
P2	2	0	0	0	2	7	5	0
P3	0	0	3	4	6	6	5	6
P4	2	3	5	4	4	3	5	6
P5	0	3	3	2	0	6	5	2

   i) Is this system currently in a safe state ? Justify your answer.

ii) If a request from P3 arrives for (0, 1, 0, 0), can that request be safely granted immediately ?

b) Consider the following set of process. CPU burst time of them are given in milliseconds.

Process	*CPU Burst Time (* ms *)*
P1	15
P2	5
P3	7
P4	10

Draw the Gantt chart for Round Robin scheduling where time quantum q = 4 milliseconds. Calculate the average waiting time and turn around time.

Mention the advantages and disadvantages of Round Robin scheduling. (4 + 3) + (4 + 4)

8. a) Consider a system with a 32-bit logical address space, a two-level paging scheme, 4 byte page table entries, 1 kB pages, and a 4 entry TLB. The page-table base register access time is 0 ns, TLB access time is 10 ns and memory access time is 100 ns.

i) How many address bits are needed for the page offset ?

ii) How much memory in bytes is required to store the outer page table entirely in main memory ?

b) i) Given references to the following pages by a program,

0, 9, 0, 1, 8, 1, 8, 7, 8, 7, 1, 2, 8, 2, 7.

How many page faults will occur if the program has three (3) page frames available to it and uses both

FIFO replacement strategy and

LRU replacement strategy.

ii) Which replacement strategy in the above performs better and why ? (2 + 3) + (2 × 4 + 2)

9. a) On a simple paged system, if references satisfied by the associative registers take 100 ns and references through the main memory page table take 180 ns, what must the hit ratio be to achieve an effective access time of 125 ns ?

b) What are the two major differences between segmentation and paging ?

c) How is paging implemented in hardware ?

d) What is internal fragmentation ? 6 + 3 + 4 + 2

10. a) What is context switching ? Why is it considered to be an overhead ?

b) What are the differences between process and thread ?

c) "All unsafe states may not lead to deadlock." — Why or why not ?

d) What is thrashing ? What is its effect on the system ? 5 + 3 + 3 + 4

11. Write short notes on the following : 5 × 3

a) Kernel level thread

b) Scan disk scheduling algorithm

c) Linked file allocation technique

d) Belady's anomaly

e) Shortest Job First (SJF) scheduling.