Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.Tech (CSE/IT)/SEM-5/CS-501/2010-11
2010-11
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) Suppose that a process is in BLOCKED state waiting from 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.

   ii) Virtual memory is

      a) an extremely large main memory

      b) an extremely large secondary memory

      c) an illusion of an extremely large memory

      d) a type of memory used in supercomputer.

iii) Which of the following scheduling algorithm does give minimum average waiting time ?

a) FCFS

b) SJF

c) Round-Robin

d) Priority.

iv) Concurrent process are those who

a) do not overlap time

b) overlap in time

c) are exerted by a process at the same time

d) none of these.

v) Banking algorithm in an operating system is used for

a) deadlock avoidance

b) deadlock recovery

c) mutual exclusion

d) context switching.

vi) Which is not a layer of operating system ?

a) Kernel

b) Shell

c) Application program

d) Critical section.

vii) To avoid race condition the maximum number of processes that may simultaneously be inside the critical section is

a) hundred

b) one

c) two

d) three.

2

viii) The scheduler which selects jobs from the pool of jobs and loads them to the ready queue is

    a)   long term   b)   short term

    c)   medium term   d)   none of these.

ix) CPU performance is measured through

    a)   Throughput   b)   MHz

    c)   Flaps   d)   None of these.

x) With a single resource, deadlock occurs

    a)   if there are more than two processes competing for that resource

    b)   if there are only two processes competing for that resource

    c)   if there is a single process competing for that resource

    d)   none of these.

GROUP – B

(Short Answer Type Questions)

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

2. Give details of how paging is implemented in hardware. Explain what a Translation Lookaside Buffer (TLB) is and give details of how it works.

3. Suppose a disk drive has 300 cylinders, numbered 0 to 299. 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 the following algorithms :

i)   SSTF

ii)   C-SCAN

4. Briefly explain the role of Semaphore in critical section problem.

5. Discuss the structure of Process Control Block.

6. With example describe if resources are not properly allocated to the processes it may lead from a safe state to an unsafe state.
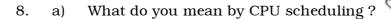
GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Briefly explain different free space management techniques.

   b) If the size of each data block is 512 bytes in Unix file system, assuming the size of a pointer is 4 bytes. Find the maximum size of a file when Inode block contains 10 direct pointers, 1 single indirect pointer, 1 double indirect pointer and 1 triple indirect pointer.

   c) Explain compaction. $6 + 6 + 3$

8. a)   What do you mean by CPU scheduling ?

    b)   Consider the following set of process. CPU burst time of

         them are given in milliseconds.

Process	CPU Burst Time
P1	15
P2	5
P3	7
P4	10

    Draw the Gantt chart for FCFS and R.R. scheduling

    where time quantum q = 5 milliseconds. Calculate the

    average waiting time.

    c)   Define turn around time of a job.

    d)   What are the advantages and disadvantages of SJF

         scheduling ?

    e)   Explain CPU scheduling criteria.   2 + 5 + 2 + 3 + 3

9. a) Consider the following snapshot :

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

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 $P1$ arrives for (1, 0, 2) can the request be granted immediately ?

b) Explain the deadlock detection mechanism in case of single instance of each resource type.

c) Consider the following snapshot of a system :

Process	Allocation			Request			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	0	0	0	0	0	0
P1	2	0	0	2	0	2			
P2	3	0	3	0	0	0			
P3	2	1	1	1	0	0			
P4	0	0	2	0	0	2			

Answer the following questions using the deadlock detection algorithm :

i) Is the system in a deadlocked state ?

ii) Suppose that *P2* makes one additional request for an instance of type *C*. If this request is granted then check deadlock occur or not.   7 + 4 + 4

10. a) What is overlays ?

b) What are the advantages of segmentation over paging ?

c)   Explain the difference between internal fragmentation and external fragmentation. Which one occurs in paging system ? How the problem of external fragmentation be solved ?

d)   State the advantages and disadvantages of single contiguous memory allocation.   2 + 3 + 6 + 4

11. a)   What is the purpose of modify bit in page table ?

b)   Consider the following page reference string :

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

How many page faults would occur for the following replacement algorithms ? Assuming 3 frames are available. Also assume that initially none of pages in main memory.

i)   Optimal replacement

ii)   FIFO replacement.

c)   What is thrashing ?

d)   Explain Belady's anomaly.   2 + 8 + 2 + 3