Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA/SEM-3/MCA-301/2010-11

2010-11

OPERATING SYSTEM AND SYSTEM SOFTWARE

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) In order to make the system deadlock free when a deadlock has occurred what needs to be done ?

      a) Kill all deadlocked processes

      b) Kill one process at a time until deadlock is eliminated

      c) Keep on allocating resources

      d) None of these.

   ii) Banker's algorithm solves the problem of

      a) Deadlock Avoidance b) Deadlock Recovery

      c) Context switching d) Mutual Exclusion.

iii) Imposing a linear order on all resource types and letting process request resources in increasing order of stock is an example of

a) Deadlock Avoidance where the system will never enter an Unsafe State

b) Deadlock Avoidance where the maximum need of each job must also be taken into account

c) Deadlock Avoidance where hold and wait conditions can not occur

d) Deadlock prevention where circular waits for resource can never take place.

iv) CPU Scheduling is the basis of

a) Batch OS b) Real time OS

c) Multi-programming d) Mono-programming.

v) CPU performance is measured through

a) Throughput b) MHz

c) Flaps d) None of these.

vi) The processes which are ready and waiting to execute are kept on a List called

a) Ready Queue

b) Waiting Queue

c) Suspended Queue

d) none of these.

vii) System calls are usually invoked by using

a) software interrupt

b) polling

c) an indirect jump

d) a privileged instruction.

viii) The page size and frame size

a) should be equal

b) need not be equal

c) page size > frame size

d) frame size > page size.

ix) A task in blocked state

a) is executable

b) must still be placed in the run queues

c) is waiting temporarily unavailable resources

d) is running.

x) A semaphore count of $-n$ ($s = -n$) means that the blocked queue contains ..... waiting process.

a) $n + 1$ b) n

c) $n - 1$ d) 0.

GROUP – B

(Short Answer Type Questions)

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

2. What is race condition ? Explain Peterson' solution for avoiding race condition. 2 + 3

3. a) What is a page fault ?

   b) Under what conditions does page fault occur ? 2 + 3

4. a) What is the difference between Process and Program ?

   b) Draw the process state transition diagram. 2 + 3

5. What is thrashing ? How can the problem of thrashing be prevented ? 2 + 3

6. a) What is a thread ?

   b) Define the classical "wait" and "signal" operations. 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) Using pre-emptive SJF (shortest-job-first) algorithm draw the Gantt chart and calculate the average waiting time and turn-around time for the following processes :

Process	Arrival time	Burst time
P_0	0	6
P_1	2	4
P_2	3	10
P_3	7	9

   b) Explain short-term, medium-term and long-term schedulings.

   c) What is a semaphore ? Which are the operations done on semaphore ?

   d) Show and explain an implementation of printer-computer [computer produces an item, keeps in a buffer from where the printer (consumer) is picking it up] problem using semaphore. 4 + 3 + 1 + 2 + 5

8. a) Consider a 'claim matrix', an 'allocation matrix' and an 'available vector' for a set of processes.

	Claim Matrix				Allocation Matrix			Available vector		
	R1	R2	R3		R1	R2	R3	R1	R2	R3
P1	3	2	2	P1	1	0	0	1	1	2
P2	6	1	3	P2	5	1	1			
P3	3	1	4	P3	2	1	1			
P4	4	2	2	P4	0	0	2			

Answer the following questions using the Banker's algorithms :

i) What are the maximum units of all resources ?

ii) What are the contents of the matrix need ?

iii) Is the system in a safe state ? If yes, find the safe sequence.

iv) A resource request for one of the processes is given. For example, if process P3 request 1 unit of R3, is this request be granted ? If yes, give a < sequence > in which all processes can run to completion.

b) What are the differences between deadlock prevention and deadlock avoidance approaches for handling deadlock ?

c) Is it possible to have multiple critical sections in a process ? Explain.

d) Explain the difference between internal fragmentation and external fragmentation. Which one occurs in paging system ? Which one occurs in systems using pure segmentation ? 6 + 3 + 2 + 4

9. a) Consider the following page reference during a given time interval for a memory consisting of 5 frames : y, c, z, c, d, a, y, a, e, a, y, f, d, e using the

   i) FIFO replacement strategy and

   ii) the LRU replacement strategy.

   Compare the results.

   b) A computer whose processes have 512 pages in their address space keeps its page tables in memory. The overhead required for reading a word from the page table is 50 n sec. To reduce this overhead, the computer has a TLB that holds 32 entries and can do look-ups in 5 n sec. What hit rate is needed to reduce the mean overhead to 20 n sec ?

   c) Describe the actions taken by the operating system when a page fault occurs.

   d) Given memory partitions of 100K, 500K, 200K, 300K and 600K (in order). How would each of the First-fit, Best-fit and Worst-fit algorithms place processes of 212K, 417K, 112K and 426K (in order) ? Which algorithm makes the most efficient use of memory ?

5 + 3 + 3 + 4

10. a) Explain contiguous allocation and linked list allocation for implementing file storage.

b) Access Matrix is used for user authentication which can be implemented by Access List and Capability List. Briefly explain the two implementations.

c) Explain, how Test and Set Lock instruction provides mutual exclusion for busy waiting.

d) Consider the following segment table :

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses ?

i) 0, 430

ii) 1, 12

iii) 2, 500

iv) 3, 400. 4 + 3 + 4 + 4

11. a) Which problem of one pass assembler motivated the design of two-pass assembler ?

b) What are the functions of a loader ?

c) What are the phases of compilation ? Explain the functionality of each phase with example.

d) What is cross-compiler ? What is linking ?

3 + 2 + 6 + 2 + 2