

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 : $10 \times 1 = 10$
 - 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

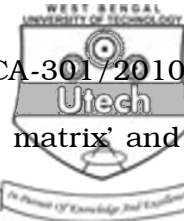
(Long Answer Type Questions)

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



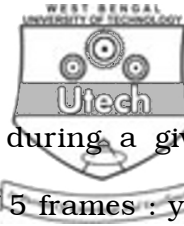
8. a) Consider a 'claim matrix', an 'allocation matrix' and an 'available vector' for a set of processes.

	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
- FIFO replacement strategy and
 - 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 ?

$$3 + 2 + 6 + 2 + 2$$

