

Code: AC13
Time: 3 Hours

JUNE 2011

Subject: OPERATING SYSTEMS
Max. Marks: 100

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2 × 10)

- a. Page fault occurs when
- (A) the page is corrupted by application software
(B) the page is in main memory
(C) the page is not in memory
(D) one tries to divide a number by 0
- b. An operating system contains 3 users processes each requiring 2 units of resource R. The minimum number of units of R such that no deadlock will ever occurs is
- (A) 3 (B) 4
(C) 5 (D) 6
- c. Pre-emptive scheduling, is the strategy of temporarily suspending a running process
- (A) before its CPU time slices expires
(B) to allow starving process to run
(C) when it requires I/O
(D) none of the above
- d. In round robin CPU scheduling, as the time quantum is increased, the average turn around time
- (A) increases (B) decreases
(C) remains constant (D) varies irregularly
- e. Which of the following is an example of a SPOOLED device?
- (A) The terminal used to enter the input data for a program being executed.
(B) The secondary memory device in a virtual memory system.
(C) A line printer used to print the output of a number of jobs.
(D) None of the above.

- f. The main function of shared memory is to
- (A) use primary memory efficiently
 - (B) do intra process communication
 - (C) do inter process communication
 - (D) none of the above
- g. Reliability and parallelism of disk drive access is improved using
- (A) DMA
 - (B) RAID
 - (C) GUI
 - (D) IPC
- h. Thrashing
- (A) reduces page I/O
 - (B) decreases the degree of multiprogramming
 - (C) implies excessive page I/O
 - (D) improves the system performance
- i. Dirty bit for a page in a page table
- (A) helps avoid unnecessary writes on a paging device
 - (B) helps maintain LRU information
 - (C) allow only read on page
 - (D) none of the above
- j. Disk scheduling involves deciding
- (A) which disk should be accessed next
 - (B) the order in which disk access requests must be serviced
 - (C) the physical location where files should be accessed in the disk
 - (D) none of the above

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

- Q.2** a. Define the essential properties of the following types of operating systems (5)
- (i) Batch
 - (ii) Interactive
 - (iii) Timesharing
 - (iv) Real time
 - (v) Distributed
- b. What are the differences between a trap and an interrupt? What is the use of each function? (3)
- c. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds: (8)

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

The processes are assumed to have arrived in the order, P1, P2, P3, P4, and P5 all at time 0.

- Draw Gantt charts illustrating the execution of these processes using a non preemptive priority (a smaller priority number implies a higher priority) and RR (quantum=1) scheduling.
- What is the turnaround time of each process for each of the scheduling algorithms in part (i)?
- What is the waiting time of each process for each of the scheduling algorithms in part (i)?

Q.3 a. Explain what is a deadlock with the help of an example? What are the various ways system can recover from deadlocks? (8)

- Given a set of cooperating processes, some of which “produce” data items(producers) to be “consumed” by others(consumers) ,with possible disparity between production and consumption rates. Devise a synchronization protocol that allows both producers and consumers to operate concurrently at their respective service rates in such a way that produced items are consumed in the exact order in which they are produced (FIFO). (8)

Q.4 a. For a paged system, TLB hit ratio is 0.9.Let the RAM access time, t , be 20 ns and the TLB access time T , be 100 ns. Find out
 (i) Effective memory access with TLB
 (ii) Effective memory access without TLB
 (iii) Reduction in effective memory access time. (8)

- What is paging? What is the hardware support required for paging? Describe this with the help of a diagram. What are the security and protection mechanisms in paging? (8)

Q.5 a. What is the cause of thrashing? How does the system detect thrashing? Once it detects thrashing, what can the system do to eliminate this problem? (8)

- Consider the following page reference string:
 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6.
 How many pages faults would occur for the following replacement algorithms, assuming four frames? Remember all frames are initially empty, so your first unique pages will all cost fault each.
 (i) FIFO replacement (ii) Optimal replacement (8)

Q.6 a. Linux runs on variety of hardware platforms. What steps must the Linux developers take to ensure that the system is portable to different processors and memory management architectures and to minimize the amount of architecture specific kernel code? (8)

- What is the purpose of system calls? Describe the different types of system calls provided by an operating system. (8)

- Q.7** a. Suppose that the head of a moving head disk with 200 tracks, numbered 0 to 199, is currently serving a request at track 143 and has just finished a request at track 142. The queue of request is kept in the FIFO order- 86, 147, 91, 177, 94, 150, 102, 175, 130. What is the total number of head movements needed to satisfy these request for the following disk-scheduling algorithms?
- (i) FCFS (ii) SSTF
(iii) SCAN (iv) LOOK (8)
- b. Why is it advantageous for the user for an operating system to dynamically allocate its internal tables? What are the penalties to the operating system for doing so? (5)
- c. Why must the bitmap for file allocation be kept on mass storage, rather than in main memory? (3)
- Q.8** a. What is the meaning of the term busy waiting? What other kinds of waiting are there? Can busy waiting be avoided altogether? Explain your answer. (5)
- b. Differentiate between a process and a thread. (5)
- c. Under what circumstances is a token-ring network more effective than an Ethernet network? (6)
- Q.9** a. How does DMA increase system concurrency? How does it complicate hardware design? (6)
- b. What are the benefits of a DFS when compared to a file system in a centralized system? (5)
- c. What are the advantages of encrypting data stored in the computer system? (5)