

**ALCCS - NEW SCHEME**

Code: CT31  
Time: 3 Hours

Subject: OPERATING SYSTEM  
Max. Marks: 100

**AUGUST 2011**

**NOTE:**

- Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.
- Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.
- Parts of a question should be answered at the same place.

**Q.1**

- Define multiprogramming and Time sharing.
- Describe the contents of a Process Control Block (PCB) briefly.
- Differentiate between pre-emptive and non-preemptive scheduling.
- What are the properties which a data item should possess to implement a critical section?
- Draw the state diagram of a process from its creation to termination including all transitions.
- Define deadlock. List the necessary conditions for deadlock to occur.
- What is swapping? Does swapping increase the Operating Systems' overheads? Justify your answer. (7 × 4)

- Q.2**
- Write down different system calls for performing different kinds of tasks. (6)
  - Discuss the issues, which need to be looked into designing a distributed operating system. (6)
  - What are threads? Why are they required? Discuss the differences between Kernel level and user level threads? (6)

- Q.3**
- Suppose that a process scheduling algorithm favors those processes that have used the least processor time in the recent past. Why will this algorithm favor I/O-bound processes, but not starve CPU-bound processes? (4)
  - Why is segmented paging important (as compared to a paging system)? What are the different pieces of the virtual address in a segmented paging system? (4)
  - Suppose two processes enter the ready queue with the following properties:

Process 1 has a total of 8 units of work to perform, but after every 2 units of work, it must perform 1 unit of I/O (so the minimum completion time of this process is 12 units). Assume that there is no work to be done following the last I/O operation.

Process 2 has a total of 20 units of work to perform. This process arrives just behind P1.

Show the resulting schedule for the shortest-job-first (preemptive) and the round-robin algorithms. Assume a time slice of 4 units of RR. What is the completion time of each process under each algorithm? (10)

**Q.4** a. Suppose there are 2 copies of resource A, 3 copies of resource B, and 3 copies of resource C. Suppose further that process 1 holds one unit of resources B and C and is waiting for a unit of A; that process 2 is holding a unit of A and waiting on a unit of B; and that process 3 is holding one unit of A, two units of B, and one unit of C. Draw the resource allocation graph. Is the system in a deadlocked state? Why or why not? (9)

b. An operating system contains 3 resource classes. The number of resource units in these classes is 7, 7 and 10. The current resource allocation state is shown below:

Processes	Allocated resources			Maximum requirements		
	R1	R2	R3	R1	R2	R3
P1	2	2	3	3	6	8
P2	2	0	3	4	3	3
P3	1	2	4	3	4	4

- (i) Is the current allocation state safe?  
 (ii) Can the request made by process P1 (1, 1, 0) be granted? (9)

**Q.5** a. Explain the differences between:

- (i) Logical and physical address space.  
 (ii) Internal and external fragmentation.  
 (iii) Paging and segmentation. (9)

b. Given memory partitions of 100k, 500k, 200k, 300k, and 600k (in order), apply first fit and best fit algorithms to place processes with the space requirement of 212k, 417k, 112k and 426k (in order)? Which algorithm makes the most effective use of memory? (4)

c. Consider the situation in which the disk read/write head is currently located at track 45 (of tracks 0-255) and moving in the positive direction. Assume that the following track requests have been made in this order: 40, 67, 11, 240, 87. What is the order in which optimised C-SCAN would service these requests and what is the total seek distance? (5)

**Q.6** a. What are semaphores? How do they implement mutual exclusion? (6)

- b. What are interacting processes? Explain any two methods of implementing interacting processes. (6)
- c. Why are Translation Look-aside Buffers (TLBs) important? In a simple paging system, what information is stored in a typical TLB table entry? (6)
- Q.7** a. Differentiate between protection and security. Explain the techniques used for protection of user files. (6)
- b. Write a detailed note on the following:
- (i) Stateful versus stateless service
  - (ii) Different techniques with which a file can be shared among different users.
  - (iii) Requirements of multimedia kernel (12)