



Printed Pages : 7

TCS – 601

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 1077**

Roll No.

## B. Tech.

(SEM. VI) EXAMINATION, 2006-07

### OPERATING SYSTEMS

*Time : 3 Hours]*

*[Total Marks : 100*

*Note : (1) Attempt all questions. All questions carry equal marks.*

*(2) Use suitable diagram wherever necessary.*

**1** Attempt any **four** of the following : **4×5**

- (a) Enumerate the basic functions of Operating System and explain each in brief.
- (b) Write short-notes on the following :
  - (i) Time Sharing System
  - (ii) Real-Time System.
- (c) Explain the microkernel approach to operating system design. Also enumerate its advantages and disadvantages.
- (d) List five services provided by an Operating System. Explain how each of them provides convenience to the users. Explain in which cases it would be impossible for user-level programs to provide these services.

- (e) What is the purpose of the System Calls or Application Programmer Interface (APIs). Enumerate five system calls used in process management or file management.
- (f) Define and explain the need of System Protection. Give two examples.

**2** Attempt any **four** of the following : **4×5**

- (a) Draw the state diagram of a process and label various transitions. Explain the need of process suspension.
- (b) Define the following terms :
  - (i) Dispatcher
  - (ii) Dispatch Latency
  - (iii) Scheduling
  - (iv) Swapping
  - (v) Context switching.
- (c) Differentiate between user thread and kernel thread. What is thread cancellation? Explain its type.
- (d) Explain various thread models with their relative advantages and disadvantages.
- (e) Define a critical section problem and its solution by using Semaphore. Use this approach to solve Producer/Consumer problem.

- (f) Explain with respect to IPC.
- (i) Synchronous and Asynchronous Communication
  - (ii) Need of buffering and its implementation.

**3** Attempt any **two** of the following : **2×10**

- (a) What are necessary conditions to hold a deadlock in a system? Explain the Resource allocation graph algorithm to deal with deadlock problem. What are the limitations of this approach?
- (b) Consider the set of the processes given in table-1 and the following scheduling algorithms:
  - (i) First-Come First-Served
  - (ii) Round Robin(quantum=2)
  - (iii) Round Robin(quantum=1)

<i>Process id</i>	<i>Arrival time</i>	<i>Execution time</i>
A	0	4
B	2	7
C	3	3
D	3.5	3
E	4	5

**Table - 1**

If there is tie within the processes, the tie is broken in the favour of the oldest process.

- (i) Draw the Gantt chart and find the average waiting time and response time for the algorithms. Comment on your result which one is better and why?
  - (ii) If the scheduler takes 0.2 unit of CPU time in context switching for the completed job and 0.1 unit of additional CPU time for incomplete jobs for saving their context, calculate the percentage of CPU time wasted in each case.
- (c) Differentiate between : (**two** differences)
- (i) Multiprocessor Scheduling and Uniprocessor Scheduling
  - (ii) Deadlock Prevention and Avoidance
  - (iii) I/O bound and CPU bound job
  - (iv) Preemptive and Nonpreemptive scheduling
  - (v) Multilevel queue and Multilevel feedback queue scheduling.

**4** Attempt any **two** of the following : **2×10**

- (a) A process has four page frames allocated to it. The time of the last loading of a page into each page frame, the time of last access to the page, the virtual page number in each frame and the Referenced (R) and Modified (M) bits

for each page frame are shown in the table below. Times are in clock ticks from the process start-time at time 0.

<i>Virtual Page #</i>	<i>Frame #</i>	<i>Time Loaded</i>	<i>Time Referenced</i>	<i>M</i>	<i>R</i>
2	0	60	161	0	1
1	1	130	160	0	0
0	2	26	162	1	0
3	3	20	163	1	1

A page fault to virtual page 4 has occurred. Which page frame will have its contents replaced under each of the following replacement algorithms?

- (i) FIFO
- (ii) LRU.

Give reason in support of your answer. Also briefly explain the working of these algorithms.

- (b) Differentiate between prepaging and demand paging. On a system using demand-paged memory, it takes 120 ns to satisfy a memory request if the page is in memory. If the page is not in memory, the request takes on an

average 5 ms. What would the page fault rate need to be achieved an effective access time of 1 micro-sec? Assume the system is running only a single process and the CPU is idle during page swaps.

- (c) Write short notes on the following :
- (i) Temporal and spatial locality of reference
  - (ii) Memory protection mechanism
  - (iii) Memory allocation algorithms

**5** Attempt any **two** of the following : **2×10**

- (a) A disk with 1000 cylinders, numbers 0 to 999, compute the number of tracks the disk arm must move to satisfy all the request in the disk queue. Assume the last request serviced was at track 345 and the head is moving towards track 0. The queue in FIFO order contains request for the following tracks:

123, 874, 692, 475, 105, 376.

Perform the computation for the following scheduling algorithms:

- (i) FIFO, (ii) SSTF, (iii) SCAN.

- (b) Discuss the Contiguous, Linked, Index and Multilevel Indexing file allocation schemes. Which allocation scheme will minimize the amount of space required in directory structure and why?
  - (c) Discuss the following with respect to I/O System :
    - (i) Basic functions
    - (ii) Block and character devices
    - (iii) Spooling.
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