B. Tech.
(SEM. IV) EXAMINATION, 2006-07
OPERATING SYSTEM

Time : 3 Hours]  [Total Marks : 100

Note : Attempt all questions.

1 Attempt any two : 10×2
   (a) Explain the terms: shell, kernel, thread, process.
   (b) Describe memory and system protection requirements in multiprogramming and time-sharing systems.
   (c) What are real time operating systems? How they are developed and implemented? Illustrate some applications where they can be used?

2 Attempt any two : 10×2
   (a) Give the principles, which should be followed by any solution designed to achieve mutual exclusion in critical section problem. Also, discuss how well these principles are followed in Dekker’s solution.

V-1031] 1 [Contd...
(b) Critically evaluate the method of message passing as a means of Interprocess Communication. Justify your answer with respect to Producer-Consumer problem.

(c) What do you understand by race-condition? Give few examples of arising of race-condition in concurrent processing.

3 Attempt any two: 10×2=20

(a) Suppose that the following processes arrive for execution at the time indicated:

<table>
<thead>
<tr>
<th>Process</th>
<th>Arrival Time</th>
<th>Burst Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>P2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>P3</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>P4</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

What is the average waiting and turnaround time for these processes with:
(i) FCFS scheduling algorithm.
(ii) Preemptive SJF algorithm.
(iii) Non preemptive SJF algorithm.

(b) Describe the Banker’s algorithm for safe allocation. Consider a system with three processes and three resource types and at time T₀ the following snapshot of the system has been taken:

<table>
<thead>
<tr>
<th>Process</th>
<th>Allocated</th>
<th>Maximum</th>
<th>Available</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R1 R2 R3</td>
<td>R1 R2 R3</td>
<td>R1 R2 R3</td>
</tr>
<tr>
<td>P1</td>
<td>2 2 3</td>
<td>3 6 8</td>
<td>7 7 10</td>
</tr>
<tr>
<td>P2</td>
<td>2 0 3</td>
<td>4 3 3</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>1 2 4</td>
<td>3 4 4</td>
<td></td>
</tr>
</tbody>
</table>

V-1031] 2 [Contd...
(i) Is the current allocation safe state?
(ii) Would the following requests be granted in the current state?
   (a) Process P2 requests (1,0)
   (b) Process P1 requests (1,0)
(c) (i) Discuss the design-issues related to multiprocessor scheduling
   (ii) What are the approaches that can be used for prevention of deadlock.

4 Attempt any two : 10x2

(a) (i) Explain the difference between internal fragmentation and external fragmentation. Which one occurs in Paging system? Which one occurs in systems using pure segmentation?
   (ii) What is thrashing? When does it occur? Explain

(b) If FIFO page replacement is used with four page-frames and eight pages, how many page-faults will occur with the reference string 0 1 7 2 3 2 7 1 0 3 if the four frames are initially empty? Repeat this problem for LRV.

(c) (i) Consider the following segment table

<table>
<thead>
<tr>
<th>Segment</th>
<th>Base</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>219</td>
<td>600</td>
</tr>
<tr>
<td>1</td>
<td>2300</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>1327</td>
<td>580</td>
</tr>
<tr>
<td>4</td>
<td>1952</td>
<td>96</td>
</tr>
</tbody>
</table>

V-1031] 3 [Contd...
What are the physical addresses for the following logical addresses?

(a) 0, 430  
(b) 1, 12  
(c) 2, 500  
(d) 3, 400  
(e) 4, 110

(iii) Page size are kept in powers of 2. Why?

5 Attempt any two: 10 x 2

(a) Discuss the influence of non-contiguous allocation of disk space on the feasibility and effectiveness of the fundamental file organizations.

(b) Explain the security and protection provisions implemented in UNIX operating system.

(c) Explain shortest-seek-time-first (SSTF) Disk scheduling. Why SSTF scheduling tends to favour middle cylinders over the inner most and outer most cylinders?