Q1: Answer the following:
   A. What is the purpose of system calls? Explain that with an example. (3M)
   B. Draw the diagram that shows the “CPU switch from process to process”. (2M)
   C. Define deadlock and explain briefly the deadlock prevention mechanism. (5M)

Q2: Consider the following set of processes with the arrival time and required CPU burst time:

<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>6</td>
</tr>
<tr>
<td>P2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>P3</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>P4</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>P5</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>P6</td>
<td>14</td>
<td>6</td>
</tr>
</tbody>
</table>

Draw the Gantt-chart using preemptive shortest-job first scheduling algorithm then compute the average waiting time for all these processes. (10M)

Q3: Answer the following:
   A. Explain briefly the concept of overlays in memory management. (4M)
   B. How does the dual-mode operation give a security to the operating system? (2M)
   C. Compare between Multilevel queue scheduling and Multilevel feedback queue scheduling with examples. (4M)

Q4: Answer the following:
   A. If the operating system has a process with four pages (page0, page1, page2 and page3) and the free-frame list in memory with five frames numbered as (14, 13, 18, 20, 15). Draw the physical memory before process allocation and after process allocation and show the page table and the free-frame list before and after allocation. (6M)
   B. One of the operating system components is I/O subsystem. What are the I/O subsystem responsibilities? (4M)

Q5: Answer the following:
   A. Explain the mechanism that is used to coordinate access to shared data with the illustration of an example. (6M)
   B. Under what circumstances would a user be better off using a time-sharing system, rather than PC or single-user workstation? (4M)

Q6: Compare between the following memory management mechanisms: (10M)
   1. Paging.
   2. Segmentation.