1. Can starvation occur when the system uses the following scheduling algorithm? Briefly state the reason why.

(1) FIFO
(2) STCF
(3) exponential queue
(4) fair share
(5) RR

2. List the four necessary conditions which must hold for a computer system to be subject to deadlock, and explain why they are NOT sufficient conditions.

3. A page reference string for a program is equal to:

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3

Suppose that this program is allocated 4 page frames, which are initially empty. How many page faults will occur when this program is run using the following page replacement algorithms:

(1) LRU algorithm.
(2) MIN algorithm.

4. State two problems with the SCTF (shortest time to completion first) scheduling algorithm, and show how they are addressed in Unix "fair share" scheduling.

5. Suppose we use segmentation in our system with 2-bit segment number and 12-bit offset. We have the following segmentation table (all numbers in hexadecimal).

<table>
<thead>
<tr>
<th>Segment</th>
<th>Base</th>
<th>Bounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4000</td>
<td>6FF</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>4FF</td>
</tr>
<tr>
<td>2</td>
<td>3000</td>
<td>FFF</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(a) Where is logical address 240 in physical memory?
(b) What is the lowest address that will incur address violation?
(c) If the system uses segmentation with paging, what is the meaning of the Bounds value?