Question 1.

(This is a rough outline - some of the details are probably wrong. In particular, signalling channels have not been included.)

(a) 30 MHz of bandwidth for each of forward and reverse links.  
200 kHz radio channel spacing.  
Number of radio channels = 30 MHz / 200 kHz = 150

(b) 64 radio bearers \( \times \) 8 users per radio bearer = 512 users

(c) Cell area = 19.6 km\(^2\).  
Number of cells = 2500/19.6 = 127 cells

(d) 150 radio channels total, with 4-cell reuse means 37 radio channels per cell.  
(Actually 37 in some and 38 in others)

(e) (i) 127 cells  
(ii) 127 * 37 radio channels  
(iii) 127 * 37 * 8 user channels

(f) 127*(500000+37*50000) = $298,000,000

(g) 37*8 = 296 user channels (signalling channels have been ignored here, but really should be included). At 5% blocking, offered traffic is 298 E.  
Assume (say) 0.05 E/subscriber. This is a guess. Obviously the figures are very sensitive to this value.

Then total # of subscribers is 127 * 298 / 0.05 = 757,000

(h) $298,000,000 * 10% / 757,000 = $39.  
This is for a fully loaded system. But it is unlikely that this number of subscribers could be attracted from the start.

So consider some alternative scenarios where less than 37 radio channels are installed at startup.

<table>
<thead>
<tr>
<th>Radio Channels per cell</th>
<th>System cost (E)</th>
<th>traffic/cell (Erlangs)</th>
<th># of users</th>
<th>$/user for 10% cost recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$69,850,000</td>
<td>4.54</td>
<td>11532</td>
<td>$606</td>
</tr>
<tr>
<td>2</td>
<td>$76,200,000</td>
<td>11.54</td>
<td>29312</td>
<td>$260</td>
</tr>
<tr>
<td>3</td>
<td>$82,550,000</td>
<td>19.03</td>
<td>48336</td>
<td>$171</td>
</tr>
<tr>
<td>4</td>
<td>$88,900,000</td>
<td>26.75</td>
<td>67945</td>
<td>$131</td>
</tr>
</tbody>
</table>

etc