1) Consider the following relation:

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a1</td>
<td>b2</td>
<td>c4</td>
<td>d1</td>
<td>e3</td>
</tr>
<tr>
<td>a2</td>
<td>b4</td>
<td>c3</td>
<td>d2</td>
<td>e4</td>
</tr>
<tr>
<td>a3</td>
<td>b1</td>
<td>c2</td>
<td>d1</td>
<td>e2</td>
</tr>
<tr>
<td>a4</td>
<td>b2</td>
<td>c4</td>
<td>d1</td>
<td>e1</td>
</tr>
</tbody>
</table>

Which of the following dependencies can you infer does not hold over the above Schema?

(1-1) B → C
(1-2) A → B
(1-3) D → C
(1-4) A → D
(1-5) B → A
(1-6) E → A
(1-7) C → E

2) Suppose you are given a relation R with five attributes, ABCDE. For each of the following sets of FDs, assuming those are the only dependencies that hold for R, do the following: (a) Identify the candidate key(s) for R. (b) Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF). (c) If R is not in BCNF, decompose it into a set of lossless and dependency preserving BCNF relations, if possible.

(2-1) E → AB, CD → E
Candidate Keys: (CD)
Normal Form: 2NF
BCNF: (C,D,E) ; (E,A,B). Create a relation for CD → E and one for E → AB

(2-2) ABC → DE, AB → D, D → E
Candidate Keys: (A,B,C)
Normal Form: 1NF
BCNF: (A,B,C) ; (A,B,D) ; (D,E). Create relation for ABC(Key). From AB we can get D. From D we can get E. ABC → DE is preserved.

(2-3) A → B, C → D, C → E
Candidate Keys: (A,C)
Normal Form : 1NF
BCNF : (A,B) ; (C,D,E) ; (A,C). Create relation AB for A → B. Create relation CDE for C → D and C → E. Finally, to ensure lossless create relation AC.

(2-4) ABC → D, ABC → E
Candidate Keys : (A,B,C)
Normal Form : BCNF
BCNF : Already in BCNF. (A,B,C,D,E)