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605.441 Problem Set 8

1. 11.6 The property of losslessness must be preserved in a functional decomposition. This is because if a decomposition is lossless, spurious tuples will be generated, possibly adding data to the database which was never added. If a decomposition lacks dependency preservation, then the database will still be able to check the constaint that the dependency enforces, it will just require one or more join operation be completed. While this may take computational time, it does not introduce any invalid tuples to the relations.

2. 11.27
   A key for R could be {Room_no, Days_hours, Semester, Year}.
   To find the 3NF Decomposition of R we need to first calculate a minimal cover.
   Course_no → offering_dept
   Course_no → credit_hours
   Course_no → course_level
   Room_no, days_hours, semester, year → instructor
   Room_no, days_hours, semester, year → course_no
   Room_no, days_hours, semester, year → sec_no
   Room_no, days_hours, semester, year → numofstudents
   Then the 3NF Decomposition would be
   {Course_no, offering_dept, credit_hours, course_level}
   {Room_no, days_hours, semester, year,instructor, course_no, sec_no,, numstudents}.
   The BNCF Decomposition would be the same.

3. 11.29(a)
   This decomposition has the dependency preservation property, since the projection of all the dependencies onto the decomposition are contained in the relation schemas.

	a	b	c	d	e	f	g	h	i	j
ABC	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10
ADE	a1			a4	a5				a9	a10
BF		a2			a6	a7	a8			
FGH					a6	a7	a8			
DIJ			a4				a9	a10		

   So this decomposition is not lossless.

4. 13.7 Accessing a disk block is expensive because it requires movement

of mechanical parts. When accessing a disk block the read/write head must be moved into the correct position and the the platters must be rotated so that the correct sectore is located directly beneath the read/write head. Only then can the block be read off of the disk and into memory. This whole operation will take several milliseconds to complete, which is an eternity in computer time, especially when thousands of block may need to be read and written at the same time.