CS 4513 Dr. Le Gruenwald
Solutions for Practice Homework Assignment 3

13.1

Answer:

a. Although moving record 6 to the space for 5 and moving record 7 to the space for 6 is the most straightforward approach, it requires moving the most records and involves the most accesses.

b. Moving record 7 to the space for 5 moves fewer records but destroys any ordering in the file.

c. Marking the space for 5 as deleted preserves ordering and moves no records, but it requires additional overhead to keep track of all of the free space in the file. This method may lead to too many "holes" in the file, which if not compacted from time to time, will affect performance because of the reduced availability of contiguous free records.

13.2

Answer:

We use "↑ *i*" to denote a pointer to record "*i*".

a. See Figure 13.101.

b. See Figure 13.102. Note that the free record chain could have alternatively been from the header to 4, from 4 to 2, and finally from 2 to 6.

c. See Figure 13.103.

header				↑ 4
record 0	10101	Srinivasan	Comp. Sci.	65000
record 1	24556	Turnamian	Finance	98000
record 2	15151	Mozart	Music	40000
record 3	22222	Einstein	Physics	95000
record 4				↑ 6
record 5	33456	Gold	Physics	87000
record 6				
record 7	58583	Califieri	History	62000
record 8	76543	Singh	Finance	80000
record 9	76766	Crick	Biology	72000
record 10	83821	Brandt	Comp. Sci.	92000
record 11	98345	Kim	Elec. Eng.	80000

Figure 13.101 The file after **insert** (24556, Turnamian, Finance, 98000).

header				↑ 2
record 0	10101	Srinivasan	Comp. Sci.	65000
record 1	24556	Turnamian	Finance	98000
record 2				↑ 4
record 3	22222	Einstein	Physics	95000
record 4				↑ 6
record 5	33456	Gold	Physics	87000
record 6				
record 7	58583	Califieri	History	62000
record 8	76543	Singh	Finance	80000
record 9	76766	Crick	Biology	72000
record 10	83821	Brandt	Comp. Sci.	92000
record 11	98345	Kim	Elec. Eng.	80000

Figure 13.102 The file after **delete** record 2.

header				↑ 4
record 0	10101	Srinivasan	Comp. Sci.	65000
record 1	24556	Turnamian	Finance	98000
record 2	34556	Thompson	Music	67000
record 3	22222	Einstein	Physics	95000
record 4				↑ 6
record 5	33456	Gold	Physics	87000
record 6				
record 7	58583	Califieri	History	62000
record 8	76543	Singh	Finance	80000
record 9	76766	Crick	Biology	72000
record 10	83821	Brandt	Comp. Sci.	92000
record 11	98345	Kim	Elec. Eng.	80000

Figure 13.103 The file after **insert** (34556, Thompson, Music, 67000).

13.3

Answer:

The relation *section* with three tuples is as follows:

course_id	sec_id	semester	year	building	room_number	time_slot_id
BIO-301	1	Summer	2010	Painter	514	A
CS-101	1	Fall	2009	Packard	101	H
CS-347	1	Fall	2009	Taylor	3128	C

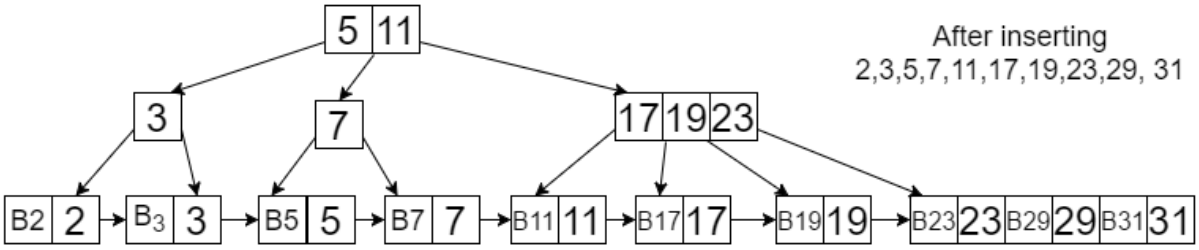
The relation *takes* with five students for each section is as follows.

ID	course_id	sec_id	semester	year	grade
00128	CS-101	1	Fall	2009	A
00128	CS-347	1	Fall	2009	A-
12345	CS-347	1	Fall	2009	A
12345	CS-101	1	Fall	2009	C
17968	BIO-301	1	Summer	2010	null
23856	CS-347	1	Fall	2009	A
45678	CS-101	1	Fall	2009	F
54321	CS-101	1	Fall	2009	A-
54321	CS-347	1	Fall	2009	A
59762	BIO-301	1	Summer	2010	null
76543	CS-101	1	Fall	2009	A
76543	CS-347	1	Fall	2009	A
78546	BIO-301	1	Summer	2010	null
89729	BIO-301	1	Summer	2010	null
98988	BIO-301	1	Summer	2010	null

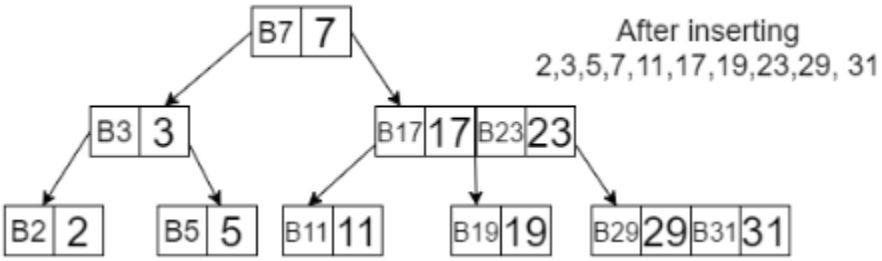
The multitable clustering for the above two instances can be taken as:

BIO-301	1	Summer	2010	Painter	514	A
17968	BIO-301	1	Summer	2010	null	
59762	BIO-301	1	Summer	2010	null	
78546	BIO-301	1	Summer	2010	null	
89729	BIO-301	1	Summer	2010	null	
98988	BIO-301	1	Summer	2010	null	
CS-101	1	Fall	2009	Packard	101	H
00128	CS-101	1	Fall	2009	A	
12345	CS-101	1	Fall	2009	C	
45678	CS-101	1	Fall	2009	F	
54321	CS-101	1	Fall	2009	A-	
76543	CS-101	1	Fall	2009	A	
CS-347	1	Fall	2009	Taylor	3128	C
00128	CS-347	1	Fall	2009	A-	
12345	CS-347	1	Fall	2009	A	
23856	CS-347	1	Fall	2009	A	
54321	CS-347	1	Fall	2009	A	
76543	CS-347	1	Fall	2009	A	

14.3 (a) B+-tree



14.3 (b) B-tree



24.6

Answer:

The extendable hash structure is shown in Figure 24.101

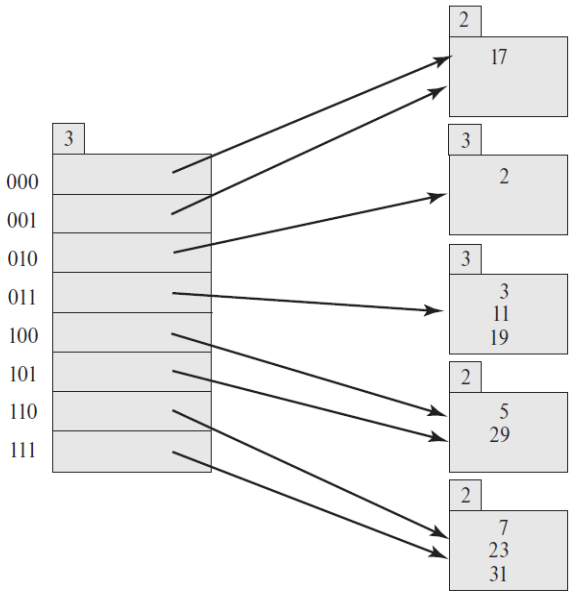


Figure 24.101 The extendable hash structure for Exercise 24.6.