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Assignment 5

Question 1:

$\{Classid\}^+$ = {Classid, Course#, Instr_name, Credit_hrs, Text, Publisher, Classroom, Capacity}

$\{Course, Instr\_name\}^+$ ={Course#, Instr_name}

{Course#, Instr_name, Credit_hrs}

{Course#, Instr_name, Credit_hrs, Text, Classroom}

{Course#, Instr_name, Credit_hrs, Text, Classroom, Publisher}

{Course#, Instr_name, Credit_hrs, Text, Classroom, Publisher, Capacity}

Question 2: Is the set of functional dependencies F in Question 1 minimal? If not, try to find a minimal set of functional dependencies that is equivalent to F. Prove that your set is equivalent to F.

F-min:

Step 1&2

Classid -> Course#

Classid -> Instr_name

Classid -> Credit_hrs

Classid -> Text

Classid -> Publisher

Classid -> Classroom

Classid -> Capacity

Course# -> Credit_hrs

{Course#, Instr_name} -> Text

{Course#, Instr_name} -> Classroom

Text -> Publisher

Classroom -> Capacity

Step 3

Classid -> Course#

Classid -> Instr_name

~~*Classid -> Credit_hrs*~~ (Classid -> Course# & Course# -> Credit_hrs)

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~~*Classid -> Text*~~ ((Classid -> Course# & Classid -> Instr_name) & {Course#, Instr_name} -> Credit_hrs)

~~*Classid -> Publisher*~~ (Classid -> Text & Text -> Publisher)

~~*Classid -> Classroom*~~((Classid -> Course# & Classid -> Instr_name) & {Course#, Instr_name} -> Credit_hrs)

~~*Classid -> Capacity*~~(Classid -> Classroom & Classroom -> Publisher)

Course# -> Credit_hrs

{Course#, Instr_name} -> Text

{Course#, Instr_name} -> Classroom

Text -> Publisher

Classroom -> Capacity

Finally,

Classid -> Course#

Classid -> Instr_name

Course# -> Credit_hrs

{Course#, Instr_name} -> Text

{Course#, Instr_name} -> Classroom

Text -> Publisher

Classroom -> Capacity

Equivalence Check

- F closures

$\{Classid\}^+$ = {Classid, Course#, Instr_name, Credit_hrs, Text, Publisher, Classroom, Capacity}

$\{Course\#\}^+$ =

$\{Course\#, Instr\_name\}^+$ = {Course#, Instr_name, Credit_hrs, Text, Classroom, Publisher, Capacity}

Text -> Publisher

Classroom-> Capacity

- F-min closures

$\{Classid\}^+$ = {Classid, Course#, Instr_name, Credit_hrs, Text, Publisher, Classroom, Capacity}

$\{Course, Instr\_name\}^+$ = {Course#, Instr_name, Credit_hrs, Text, Classroom, Publisher, Capacity}

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Text -> Publisher

Classroom-> Capacity

- Therefore,

F is a subset of F-min & F-min is a subset of F

SO F and F-min are equivalent.

Question 3:

The Key is: ABD

Because ABD is always on the RHS and its closure includes all other attributes:

ABD^{+} = A, B, D, C, E, F, G, H, J, I

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Question 4:

(A) R1 = {A, B, C}, R2 = {A, D, E}, R3 = {B, F}, R4 = {F, G, H}, R5 = {D, I, J}

Dependency preservation property – NO

{A, B} -> C is preserved in R1
{B. D} -> {E, F} not preserved
{A, D} -> {G, H} not preserved
A -> I not preserved
H -> J not preserved

Lossless join property – NO

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	B_{14}	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	a	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

{A, B} -> C

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	B_{14}	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	a	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

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{B. D} -> {E, F}

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	B_{14}	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	a	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

{A, D} -> {G, H}

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	B_{14}	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	a	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

A -> I

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	B_{14}	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	a	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{19}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

H -> J

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	B_{14}	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	a	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{19}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

1NF

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(B) R1 = {A, B, C, D, E}, R2 = {B, F, G, H}, R3 = {D, I ,J}

Dependency preservation property – NO

{A, B} -> C is preserved in R1

{B. D} -> {E, F} not preserved

{A, D} -> {G, H} not preserved

A -> I not preserved

H -> J not preserved

Lossless join property – NO

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	a	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	a	B_{23}	B_{24}	B_{25}	a	a	a	B_{29}	B_{20}
R3	B_{31}	B_{32}	B_{33}	a	B_{35}	B_{36}	B_{37}	B_{38}	a	a

{A, B} -> C

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	a	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	a	B_{23}	B_{24}	B_{25}	a	a	a	B_{29}	B_{20}
R3	B_{31}	B_{32}	B_{33}	a	B_{35}	B_{36}	B_{37}	B_{38}	a	a

{B. D} -> {E, F}

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	a	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	a	B_{23}	B_{24}	B_{25}	a	a	a	B_{29}	B_{20}
R3	B_{31}	B_{32}	B_{33}	a	B_{35}	B_{36}	B_{37}	B_{38}	a	a

{A, D} -> {G, H}

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	a	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	a	B_{23}	B_{24}	B_{25}	a	a	a	B_{29}	B_{20}
R3	B_{31}	B_{32}	B_{33}	a	B_{35}	B_{36}	B_{37}	B_{38}	a	a

A -> I

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	a	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	a	B_{23}	B_{24}	B_{25}	a	a	a	B_{29}	B_{20}
R3	B_{31}	B_{32}	B_{33}	a	B_{35}	B_{36}	B_{37}	B_{38}	a	a

H -> J

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	a	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	a	B_{23}	B_{24}	B_{25}	a	a	a	B_{29}	B_{20}
R3	B_{31}	B_{32}	B_{33}	a	B_{35}	B_{36}	B_{37}	B_{38}	a	a

1NF

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(C) R1 = {A, B, C, D}, R2 = {D, E}, R3 = {B, F}, R4 = {F, G, H}, R5 = {D, I, J}

Dependency preservation property – NO

{A, B} -> C is preserved in R1

{B. D} -> {E, F} not preserved

{A, D} -> {G, H} not preserved

A -> I not preserved

H -> J not preserved

Lossless join property – NO

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

{A, B} -> C

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

{B. D} -> {E, F}

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

{A, D} -> {G, H}

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

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A -> I

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

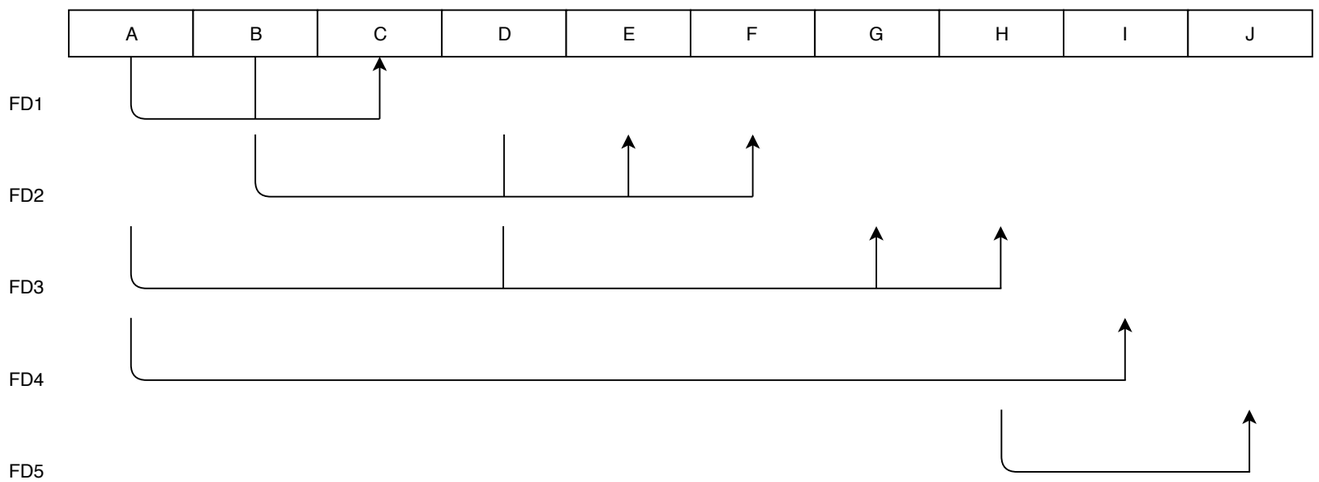
H -> J

	A1	B2	C3	D4	E5	F6	G7	H8	I9	J0
R1	a	a	a	a	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	B_{10}
R2	B_{21}	B_{22}	B_{23}	a	a	B_{26}	B_{27}	B_{28}	B_{29}	B_{20}
R3	B_{31}	a	B_{33}	B_{34}	B_{35}	a	B_{37}	B_{38}	B_{39}	B_{30}
R4	B_{41}	B_{42}	B_{43}	B_{44}	B_{45}	a	a	a	B_{49}	B_{50}
R5	B_{51}	B_{52}	B_{53}	a	B_{55}	B_{56}	B_{57}	B_{58}	a	a

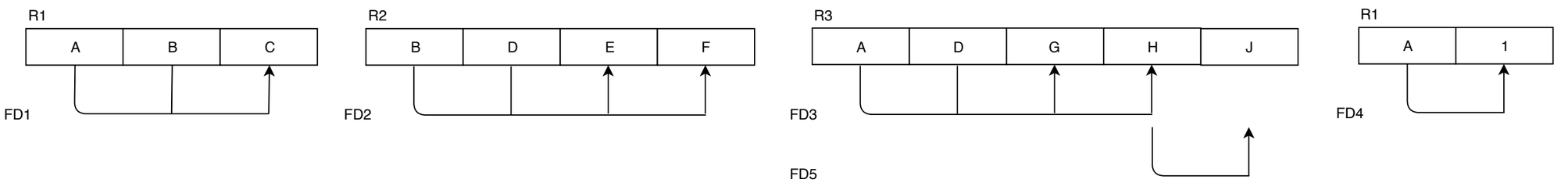
2NF

QUESTION 3

1NF



2NF



3NF