Relational Algebra Exercise (from a past quiz)

Consider the following two tables **R** and **S** with their instances:

R

A	B	C
a	x	y
a	z	w
b	x	k
b	m	j
c	x	y
d	m	y
f	g	h

S

D	E	F
x	a	5
z	w	3
g	j	7
x	h	8
t	b	9
x	m	8
z	d	2

List the final **Result** (table instances) of the following relational algebra query:

$$\textbf{Temp1} \leftarrow \pi_{A,E,F}(R \bowtie_{B=D} S)$$
$$\textbf{Result} \leftarrow \pi_{A,E}(\sigma_{F>5}(\textbf{Temp1}))$$

(a) RESULT:

a	j
a	h
a	b
a	m
b	j
b	h
b	m
c	j
c	h
c	m
f	j

(b) RESULT:

a	h
a	m
b	h
b	m
c	h
c	m
f	j

(c) RESULT:

a	j
a	h
a	b
a	m
b	h
b	m
c	h
c	m
f	j

(d) RESULT:

a	h
a	b
a	m
b	h
b	m
c	h
c	m

Solution:

$(R \bowtie_{B=D} S)$

A	B	C	E	F
a	x	y	a	5
a	x	y	h	8
a	x	y	m	8
a	z	w	w	3
a	z	w	d	2
b	x	k	a	5
b	x	k	h	8
b	x	k	m	8
c	x	y	a	5
c	x	y	h	8
c	x	y	m	8
f	g	h	j	7

$Temp1 \leftarrow \pi_{A,E,F} (R \bowtie_{B=D} S)$

A	E	F
a	a	5
a	h	8
a	m	8
a	w	3
a	d	2
b	a	5
b	h	8
b	m	8
c	a	5
c	h	8
c	m	8
f	j	7

$\sigma_{F>5}(Temp1)$

A	E	F
a	h	8
a	m	8
b	h	8
b	m	8
c	h	8
c	m	8
f	j	7

$Result \leftarrow \pi_{A,E} (\sigma_{F>5}(Temp1))$

A	E
a	h
a	m
b	h
b	m
c	h
c	m
f	j

Relational Algebra (from past exam) – 15 marks

Consider the following relational schemas and sample records. (Note: the primary keys are underlined and the foreign keys are written in italics).

FILM (title, year, genre)
PROFESSIONAL (ID, name, nationality, startYear)
WORK_IN (*title, ID*, role)

FILM

Title	**Year**	**Genre**
Django Unchained	2012	Western
Inglorious Basterds	2009	Drama
Kill Bill	2003	Action

PROFESSIONAL

ID	**Name**	**Nationality**	**startYear**
QT1	Quentin Tarantino	American	1983
LD1	Leonardo DiCaprio	American	1989
CW1	Christoph Waltz	Austrian	1977

WORK_IN

Title	**ID**	**Role**
Django Unchained	QT1	Director
Inglorious Basterds	QT1	Director
Kill Bill	QT1	Director
Django Unchained	QT1	Writer
Django Unchained	LD1	Actor
Django Unchained	CW1	Actor
Inglorious Basterds	CW1	Actor

Write the following queries in relational algebra expression.

i) Display all American professionals who start working in the year 2000.

SS:

$\pi_{name}(\sigma_{nationality='American' \text{ AND } startyear=2000})(PROFESSIONAL)$

ii) Display the title and year of films directed by "Quentin Tarantino".

SS:

$\pi_{title,\ year}(FILM \bowtie_{title=title} (\sigma_{role='Director'})\ (WORK\_IN) \bowtie_{id=id} (\sigma_{name='Quentin\ Tarantino'})\ (PROFESSIONAL))$

iii) Display the name of professionals working in any western film released in 2014 or working in any drama film released in 2013.

SS:

π_{name}(PROFESSIONAL $\bowtie_{id=id}$(WORK_IN) $\bowtie_{title=title}$(σ(genre='Western' AND year=2014) OR (genre='Drama' AND year=2013)) (FILM))

SS alternative:

π_{name}(PROFESSIONAL $\bowtie_{id=id}$(WORK_IN) $\bowtie_{title=title}$ (σ genre='Western' AND year=2014) (FILM))

U

π_{name}(PROFESSIONAL $\bowtie_{id=id}$(WORK_IN) $\bowtie_{title=title}$(σ genre='Drama' AND year=2013)) (FILM))