Consider the following two relations, $R(A, B)$ and $S(A, C)$:

R

A	B
10	20
20	30
30	40
30	50
50	95

S

A	C
10	90
30	45
40	80

The total number of tuples obtained by evaluating the following expression $\sigma_{B<C}\left(R \bowtie_{R.A=S.A} S\right)$ is ___

A 1

B 2

C 4

D 6

A relation $r(A, B)$ in a relational database has 1200 tuples. The attribute A has integer values ranging from 6 to 20, and the attribute B has integer values ranging from 1 to 20. Assume that the attributes A and B are independently distributed.

The estimated number of tuples in the output of $\sigma_{(A>10)\vee(B=18)}(r)$ is _____

A 1200

B 205

C 15

D 820

Let R and S be relational schemes such that R={a,b,c} and S={c}. Now consider the following queries on the database:
$I. \pi_{R-S}(r) - \pi_{R-S}(\pi_{R-S}(r) \times S - \pi_{R-S,S}(r))$
$II. \{t | t \in \pi_{R-S}(r) \wedge \forall u \in s(\exists v \in r(u = v[s] \wedge t = v[R - S]))\}$
$III. \{t | t \in \pi_{R-S}(r) \wedge \forall v \in r(\exists u \in s(u = v[s] \wedge t = v[R - S]))\}$
IV. Select R.a, R.b From R,S Where R.c=S.c

Which of the above queries are equivalent?

A I and II

B I and III

C II and IV

D III and IV

Which of the following tuple relational calculus expression(s) is/are equivalent to $\forall t \in r(P(t))$?

I. $\neg \exists t \in r(P(t))$

II. $\neg t \notin r(P(t))$

III. $\neg \exists t \in r(\neg P(t))$

IV. $\exists t \in r(\neg P(t))$

A. I only

B. II only

C. III only

D. III and IV only

Consider the relation employee(name, sex, supervisorName) with name as the key. supervisorName gives the name of the supervisor of the employee under consideration. What does the following Tuple Relational Calculus query produce?

$$\{e.name \mid employee(e) \wedge$$

$$(\forall x)[\neg employee(x) \vee x.supervisorName \neq e.name \vee x.sex = \text{"male"}]\}$$

A. Names of employees with a male supervisor.

B. Names of employees with no immediate male subordinates

C. Names of employees with no immediate female subordinates.

D. Names of employees with a female supervisor

Consider the relation employee(name, sex, supervisorName) with name as the key. supervisorName gives the name of the supervisor of the employee under consideration. What does the following Tuple Relational Calculus query produce?

$$\{e.name \mid employee(e) \wedge$$

$$(\forall x)[\neg employee(x) \vee x.supervisorName \neq e.name \vee x.sex = \text{"male"}]\}$$

A. Names of employees with a male supervisor.

B. Names of employees with no immediate male subordinates

C. Names of employees with no immediate female subordinates.

D. Names of employees with a female supervisor

Which of the following relational query languages have the same expressive power?
I. Relational algebra
II. Tuple relational calculus restricted to safe expressions
III. Domain relational calculus restricted to safe expressions

A. II and III only
B. I and II only
C. I and III only
D. I, II and III

The relational algebra expression equivalent to the following tuple calculus expression:
$\{t \mid t \in r \wedge (t[A] = 10 \wedge t[B] = 20)\}$ is

A. $\sigma_{(A=10 \vee B=20)}(r)$
B. $\sigma_{(A=10)}(r) \cup \sigma_{(B=20)}(r)$
C. $\sigma_{(A=10)}(r) \cap \sigma_{(B=20)}(r)$
D. $\sigma_{(A=10)}(r) - \sigma_{(B=20)}(r)$