(A)

Answers

6)

6.1: SELECT   S1.SID , S2.SID
      FROM   CATALOG S1 , CATALOG S2
      WHERE   S1.PID = S2.PID AND S1.price > S2.price;

6.2: SELECT   C.SID
      FROM   Catalog C
      WHERE   C.SID IN (SELECT S.SID FROM Suppliers S
                          WHERE S.address = 'Ruston City)
                OR
                C.PID IN (SELECT P.PID FROM Parts P
                          WHERE P.color = 'red');

(B)

6)

6.1: Student SSN SName Sadd HScode HSN HSc GPA priority

$R(\ A\ ,\ B\ ,\ C\ ,\ D\ ,\ E\ ,\ F\ ,\ G\ ,\ H\ )$

FD: { $D \rightarrow EF$
       $G \rightarrow H$
       $A \rightarrow BCG$ }

$R(\ \textcircled{A}\ B\ C\ \textcircled{D}\ E\ F\ G\ H\ )$

AD candidate key $AD^+ = A\ D\ BCGHEF$,
$D \rightarrow EF$ partial   or ABCDEFGH ✓
$G \rightarrow H$ non prime
$A \rightarrow BCG$ partial

R(ABCDEFGH)
↳ R_1 (GH)   *
↳ R_2 (GABCDEF)
   ↳ $R_{2.1}$ (DEF)   *
   ↳ $R_{2.2}$ (DGABC)
      ↳ $R_{2.2.1}$ (ABCG) *
      ↳ $R_{2.2.2}$ (AD) *

or R_1 (GPA, priority)
    $R_{2.1}$ (HScode, HSName, HScity)
    $R_{2.2.1}$ (SSN, SName, Sadd, GPA)
    $R_{2.2.2}$ (SSN, HScode)

8.2: checks conducted over parse tree during optimization:
- Syntactic check: operators' usage is syntactically correct?
- entity check: relation names referred to are valid?
- view expansion: ensure parse tree of view is in tree where relation node would be
- attribute check: attribute names referred to are valid?
- type check: attributes used in expressions have proper types?

9)
9.1:

STUDENT   OWID   Name Subject Location Score
R   (A   B   C   D E)

FDs: $\{A \to B,$
$\quad A \to C,$
$\quad AD \to E\}$

① $R_1 (ABC) \bowtie R_2 (ADE)$

② $R_1 (ABDE) \bowtie R_2 (DE)$

check
I. $R = R_1 \cup R_2$
II. $R_1 \cap R_2 \neq \emptyset$
III. $R_1 \cap R_2 \to R_1$
$\quad$ or $\to R_2$

1 work
I. $R_1 \cup R_2 = R(ABCDE)$ ✓
II. $R_1 \cap R_2 = A \neq \emptyset$ ✓
III. $R_1 \cap R_2 = A$ & given FDs...
$\quad A^+ = ABC$
$\quad = R_1 \cup$
Lossless

2 work
I. $R_1 \cup R_2 = R(ABDE)$ ✗
Lossy

Answer: (B) - 1 is lossless
$\quad$ but 2 is lossy

9.2: R(A   B   C   D   E)

Report RID   Title   AID   Author   Subject

3NF
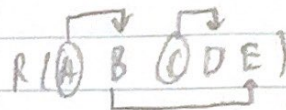
& FDs: { $A \to B$,
$\quad\quad B \to E$,
$\quad\quad C \to D$ }

R(A B C D E)   AC is candidate key
$\quad\quad\quad\quad\quad\quad\quad\quad AC^+ = ACBED$ ✓

∴ FDs: $A \to B$ partial
$\quad\quad\quad\quad B \to E$ transitive
$\quad\quad\quad\quad C \to D$ partial

R(A B C D E)
↳ R_1 (A B E)
  ↳ $R_{1.1}$ (A B) *
  ↳ $R_{1.2}$ (B E) *   or
↳ R_2 (C D) *
↳ R_3 (A C) *

$R_{1.1}$ (RID, Title)
$R_{1.2}$ (Title, Subject)
R_2 (AID, Author)
R_3 (RID, AID)