1. It is in 1NF because there are no composed attribute and multivalued attribute.
It is not in 2NF because of partial dependency on salesperson# for attribute Commission%

in 2NF: CAR_SALE(Car#, Date_sold, salesperson#, Discount_amt)
R1(salesperson#, Commisson%)

It is not in 3NF because Discount_amt is depend on Date_sold, which is non prime.

in 3NF:
CAR_SALE(Car#, Date_sold, salesperson#)
R1(salesperson#, Commisson%)
R2(Date_sold, discount_amt)

2. (a) It is in 1NF, because there are no composite attribute and multivalued attribute.
And it has partial dependency and transitive dependency.
So it is not in 2NF and 3NF.

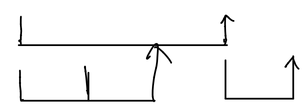
(b). BOOK (Book_title, Author name)
R1 (Book title, publisher, Book_type)
R2 (Book_type, List_price)
R3 (Author_name, Author_affil)

3. (a) $\{M\}^+ = \{M, M\_P, C\}$ cannot be, because it doesn't containing Y and P.

$\{M, Y\}^+ = \{M, Y, M\_P, P, C\}$ can be, because it contains all attributes.

$\{M, C\}^+ = \{M, C, M\_P\}$ cannot be, because it doesn't contain Y and P.

(b). REFRIG ($\underline{M}$, $\underline{Y}$, P, M_P, C)



It is not in 3NF and BCNF because it is not even in 2NF. Since M_P has partial dependency on M.

REFRIG ($\underline{M}$, $\underline{Y}$, P)

R1 ($\underline{M}$, M_P)

R2 ($\underline{M\_P}$, C)

4.

F covers G: true

$\{A\}^+ = \{A, C, D\}$ ✓

$\{E\}^+ = \{E, A, D, C, H\}$ ✓

G covers F: true

$\{A\}^+ = \{A, C, D\}$ ✓

$\{AC\}^+ = \{A, C, D\}$ ✓

$\{E\}^+ = \{E, A, H, C, D\}$ ✓

Since F covers G and G covers F, F and G is equivalent.

5.

$P \to R$
$P \to C$ x
$P \to A$
$R, C \to A$
$R, C \to P$
$A \to C$

$\to$

$P \to R$
$P \to A$
$R, C \to A$ x
$R, C \to P$
$A \to C$

$\to$

$P \to R$
$P \to A$
$R, C \to P$
$A \to C$

minimum cover

$\Rightarrow$
$R1(\underline{R}, C, P)$
$R2(\underline{P}, R, A)$
$R3(\underline{A}, C)$