Question 4

Q4.1.

$$\pi_{Pi_1.title}\left(\sigma_{Pi_1.title=Pi_2.title \wedge Pi_1.actor \neq Pi_2.actor}\left(\rho_{Pi_1}(PlaysIn) \times \rho_{Pi_2}(PlaysIn)\right)\right)$$

Q4.2.

$A := \text{Person} \bowtie \text{FanOf}$

$B := \rho_{A_1}(A) \bowtie_{A_1.title\,=\,A_2.title \,\wedge\, A_1.age\,>\,A_2.age} \rho_{A_2}(A)$

$C := \pi_{A_1.title,A_1.age}(B)$

$D := \pi_{A_3.title,A_3.age}\left(\rho_{A_3}(A)\right) \setminus C$

(D returns the title of the film and the age of the youngest fan of that film)

$E := \text{Person} \bowtie \text{PlaysIn}$

$F := \rho_{E_1}(E) \bowtie_{E_1.title\,=\,D_1.title \,\wedge\, E_1.age\,>=\,D_1.age} \rho_{D_1}(D)$

(F returns the film and the actors of that film that have age greater or equal to the age of the youngest fan)

$G := \pi_{title}(Film) \setminus \pi_{F_1.title}\left(\rho_{F_1}(F)\right)$

(G returns the titles of the films that don't have any actor with age greater or equal to the age of the youngest fan, that means all the actors are younger than the youngest fan)

Q4.3.

$A := \pi_{F.director}\left(\sigma_{F.director,F.title}\left(\rho_F(Film)\right) \setminus PlaysIn\right)$

(A returns the directors who don't act in at least one film that they direct)

$B := \sigma_{director}(Film) \setminus A$