

## Single Expressions (4 marks)

1.  $\pi_{\text{FName, LName}} (\text{PARTICIPANT})$
2.  $\pi_{\text{OlympicID}} (\sigma_{\text{Sex} = \text{'M'} \text{ AND } \text{FirstGames} = \text{'Rio 2016'}} (\text{ATHLETE}))$
3.  $\pi_{\text{Country, LName, BirthYear}} (\text{PARTICIPANT} \bowtie_{\text{P.OlympicID} = \text{A.OlympicID}} \text{ATHLETE})$
4.  $\pi_{\text{FName, Country}} (\sigma_{\text{Orientation} = \text{'Complete'}} (\text{PARTICIPANT} * \text{COACH}))$

## Procedural Sequences (9 marks)

5.  $\text{BRONZE\_MEDALISTS} \leftarrow \sigma_{\text{Medal} = \text{'Bronze'}} (\text{INDIVIDUAL\_RESULTS})$

$\text{BRONZE\_ATHLETES} \leftarrow (\text{BRONZE\_MEDALISTS} \bowtie_{\text{B.Olympian} = \text{A.OlympicID}} \text{ATHLETE})$

$\text{RESULT} \leftarrow \pi_{\text{FirstGames}} (\text{BRONZE\_ATHLETES})$

6.  $\text{IND\_GOLD} \leftarrow \sigma_{\text{Medal} = \text{'Gold'}} (\text{INDIVIDUAL\_RESULTS})$

$\text{TEAM\_GOLD} \leftarrow \sigma_{\text{Medal} = \text{'Gold'}} (\text{TEAM\_RESULTS})$

$\text{I\_CNTRY} \leftarrow \pi_{\text{Country}} (\text{IND\_GOLD} \bowtie_{\text{I.Olympian} = \text{P.OlympicID}} \text{PARTICIPANT})$

$\text{T\_ID} \leftarrow \text{TEAM\_GOLD} \bowtie_{\text{TG.Team} = \text{T.TeamID}} \text{TEAM}$

$\text{T\_CNTRY} \leftarrow \pi_{\text{Country}} (\text{T\_ID} \bowtie_{\text{T.Member1} = \text{P.OlympicID}} \text{PARTICIPANT})$

$\text{RESULT} \leftarrow \text{I\_CNTRY} \cup \text{T\_CNTRY}$

## Procedural Sequences (9 marks)

6.  $\text{IND\_GOLD} \leftarrow \sigma_{\text{Medal} = \text{'Gold'}} (\text{INDIVIDUAL\_RESULTS})$

$\text{TEAM\_GOLD} \leftarrow \sigma_{\text{Medal} = \text{'Gold'}} (\text{TEAM\_RESULTS})$

$\text{I\_CNTRY} \leftarrow \pi_{\text{Country}} (\text{IND\_GOLD} \bowtie_{\text{I.Olympian} = \text{P.OlympicID}} \text{PARTICIPANT})$

$\text{T\_ID} \leftarrow \text{TEAM\_GOLD} \bowtie_{\text{TG.Team} = \text{T.TeamID}} \text{TEAM}$

$\text{T\_CNTRY} \leftarrow \pi_{\text{Country}} (\text{T\_ID} \bowtie_{\text{T.Member1} = \text{P.OlympicID}} \text{PARTICIPANT})$

$\text{RESULT} \leftarrow \text{I\_CNTRY} \cup \text{T\_CNTRY}$

7.  $\text{WITH\_GOLD} \leftarrow \text{I\_CNTRY} \cup \text{T\_CNTRY}$

$\text{ALL\_COUNTRIES} \leftarrow \pi_{\text{Country}} (\text{PARTICIPANT})$

$\text{RESULT} \leftarrow \text{ALL\_COUNTRIES} - \text{WITH\_GOLD}$

## 8. Query Tree & Corresponding Expression (8 marks)

$\pi_{A.BirthYear} ( ( (\sigma_{E.EventDate = 'July 30' \text{ OR } 'July 31'} \text{ EVENT\_SCHEDULE}) \bowtie_{E.EventID = I.EventID} \text{INDIVIDUAL\_RESULTS}) \bowtie_{I.Olympian = A.OlympicID} \text{ATHLETE} )$

