

Database Systems

Assignment #03

Q1.

1. $\pi_{\text{Country_Name}} (\sigma_{\text{Security_Level} = \text{'Critical'}} (\text{THREAT}) \bowtie \text{THREAT.Threat_ID} = \text{INCIDENT.Threat_ID} \text{ INCIDENT})$

$\bowtie \text{INCIDENT.Country_ID} = \text{COUNTRY.Country_ID} \text{ COUNTRY}$

$\sigma_{\text{Date_Reported} \text{ BETWEEN '2025-01-01' AND '2025-12-31' } }$

First pick all threats marked as Critical, link them to incidents that happened in 2025, then match incidents with their country and display country's name.

2. $\pi_{\text{Team_Name}} ($

$\sigma_{\text{Threat_Name} = \text{'Ransomware'}} (\text{THREAT}) \bowtie \text{THREAT.Threat_ID} = \text{INCIDENT.Threat_ID} \text{ INCIDENT})$

$\bowtie \text{INCIDENT.Incident_ID} = \text{ACTION_TAKEN.Incident_ID}$

$\sigma_{\text{Resolution_Status} = \text{'Resolved'}} (\text{ACTION_TAKEN})$

$\bowtie \text{ACTION_TAKEN.Team_ID} = \text{RESPONSE_TEAM.Team_ID} \text{ RESPONSE_TEAM})$

Find incidents caused by 'ransomware', filter actions with 'resolved status', join to RESPONSE_TEAM and team names.

3. $\pi_{\text{Country_Name}} (\text{COUNTRY} \bowtie \text{COUNTRY.Country_ID} = \text{RESPONSE_TEAM.Country_ID} \text{ RESPONSE_TEAM})$

Subtract countries that appear in response teams from all countries.

4. $\pi_{\text{Threat_ID}, \text{Count_distinct}(\text{Country_ID}) \rightarrow n}(\text{INCIDENT})$

$\pi_{\text{Threat_Name}}(\sigma_{n>1}(\pi_{\text{Threat_ID}, \text{Count_distinct}(\text{Country_ID}) \rightarrow n}(\text{INCIDENT})) \bowtie \text{THREAT})$

group INCIDENT by Threat_ID counting distinct reporting countries, keep Threat_IDs with count > 1, join with threat to get names.

5. $\pi_{\text{Incident_ID}, \text{Country_Name}, \text{Impact_Score}}(\sigma_{\text{Impact_Score} > 80}(\sigma_{\text{Category} = \text{'AI Attack'}}(\text{THREAT}) \bowtie \text{THREAT.Threat_ID} = \text{INCIDENT.Threat_ID} \text{ INCIDENT} \bowtie \text{INCIDENT.Country_ID} = \text{COUNTRY.Country_ID} \text{ COUNTRY}))$

Select incidents where threat is 'AI Attack' and score > 80, join to country, and project incident_ID, country_name and impact_score

Q2.

1. Select the names of menu items that are not available and cost more than 500.
2. Select the names of items that are either a Beverage with price > 300 or a Dessert.
3. Select the name and price of all available Snacks.
4. Select the name and price/100 of all available Snacks.
5. Find supplier IDs of suppliers that supply Cappuccino.
6. Show the employee name and the cafe name for employees who work at a cafe located in the same city as their address.
7. List employee ID's of all employees whose salary is not 50,000.
8. Find supplier ID's that supply both Karachi and Lahore.
9. List item names that appear on the MenuItem table but have never been supplied.