KLE Technological University
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Earlier known as
B. V. B. College of Engineering & Technology

School of Computer Science and Engineering

Design Phase Report

Title: Disaster Response Management Database

List of Team Members:

Name	USN	Roll No.
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Abhijna Ravindra Kalbhag	01FE21BCS107	119
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Team Leader: Abhijna Ravindra Kalbhag

Responsibilities:

Name	Responsibilities
Sinchan Karogal	Problem Definition, ER diagram, Records, Queries
Jiya palrecha	Records, database, PPT, Report
Abhijna Ravindra Kalbhag	Queries, database, Schema
Sahana Kagale	ER diagram, Schema diagram, Report

Requirements Specification:

- Disaster Information Management: The database should allow for the management of disaster information, including information about disasters, affected areas, and affected populations.
- Location Management: The database should support the management of location information, including the identification of disaster locations, directions to disaster locations, and the tracking of relief efforts.
- Resource Management: The database should support the management of resources, including equipment and personnel, necessary to respond to disasters.

- Communication Management: The database should support the management of communication during disasters, including recording communication logs and tracking the status of relief efforts.
- Reporting: The database should provide comprehensive reporting capabilities for analyzing disaster data to improve the efficiency and effectiveness of disaster response.

Question 1: From the problem description, identify the entities that need to be represented in the database, the attributes of each entity, the relationships between the entities, and the cardinality ratios of each relationship.

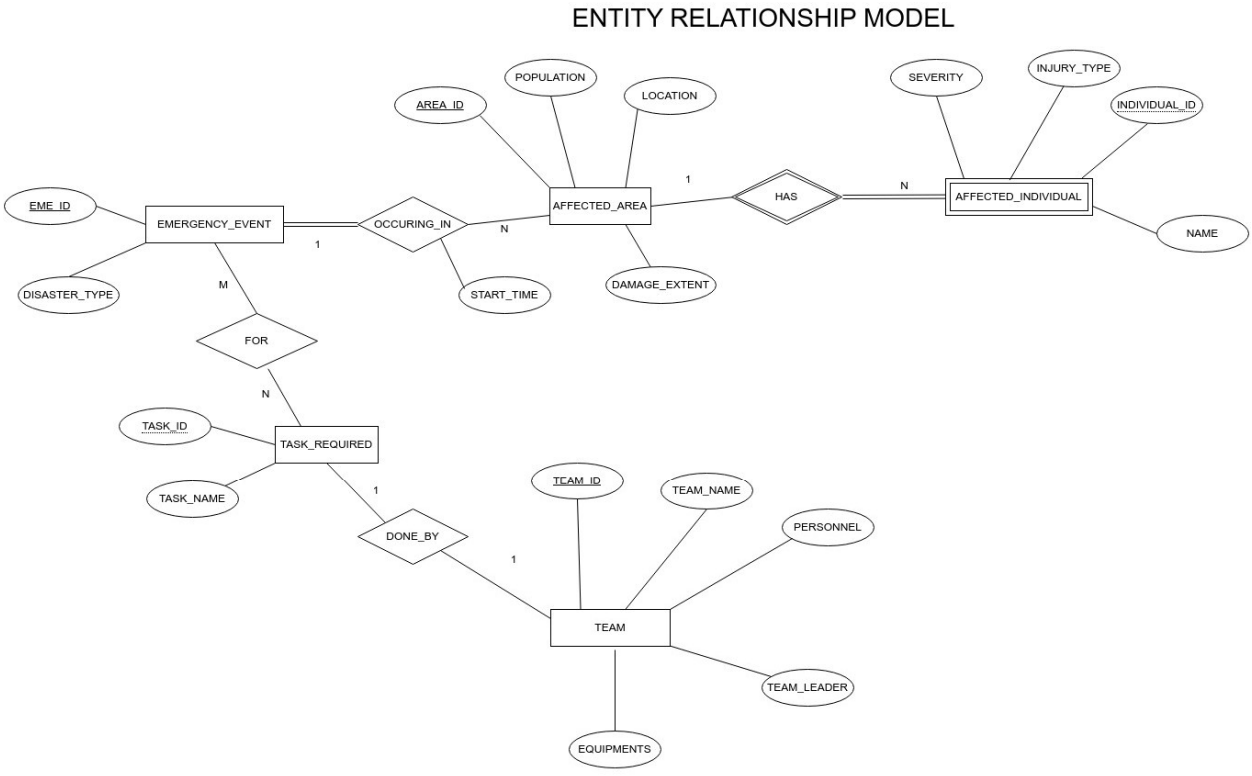
Entities and attributes:

EMERGENCY_EVENT	EMG_ID	DISASTER_TYPE	START_DATE		
AFFECTED_AREA	AREA_ID	POPULATION	LOCATION	DAMAGE_EXTENT	
AFFECTED_INDIVIDUAL	INDIVIDUAL_ID	NAME	INJURY_TYPE		
TASK	TASK_ID	TASK_NAME			
TEAM	TEAM_ID	TEAM_NAME	TEAM_LEADER	PERSONNEL	EQUIPMENT

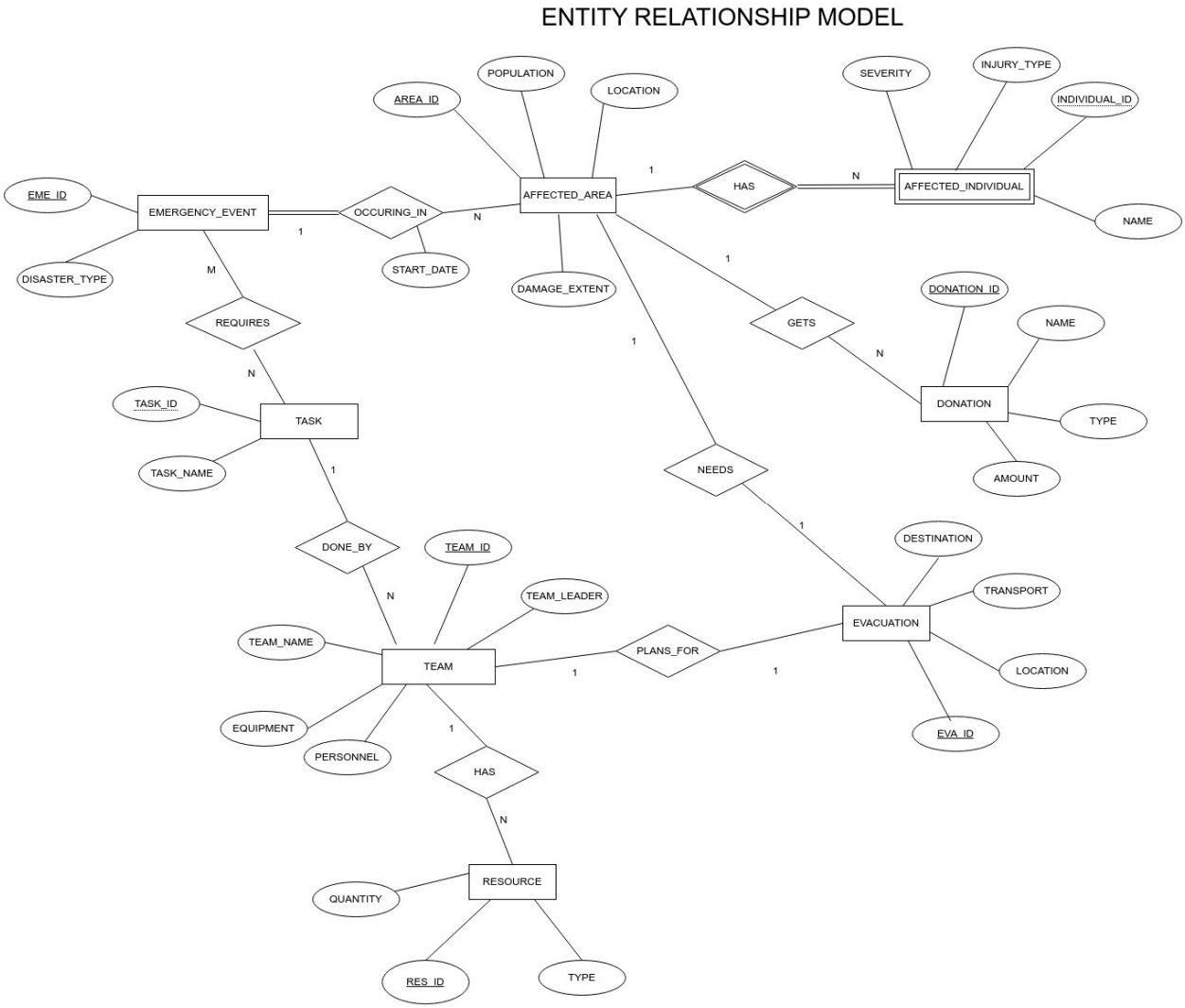
Relationship between entities and cardinality ratio:

Entity 1	Relation name	Entity 2	Cardinality ratio
EMERGENCY_EVENT	OCCURING_IN	AFFECTED_AREA	1: N
AFFECTED_AREA	HAS	AFFECTED_INDIVIDUAL	1: N
TASK	FOR	EMERGENCY_EVENT	M: N
TASK	DONE_BY	TEAM	1: 1

Question 2: Draw an Entity-Relationship Diagram illustrating the information you have identified in Question 1.



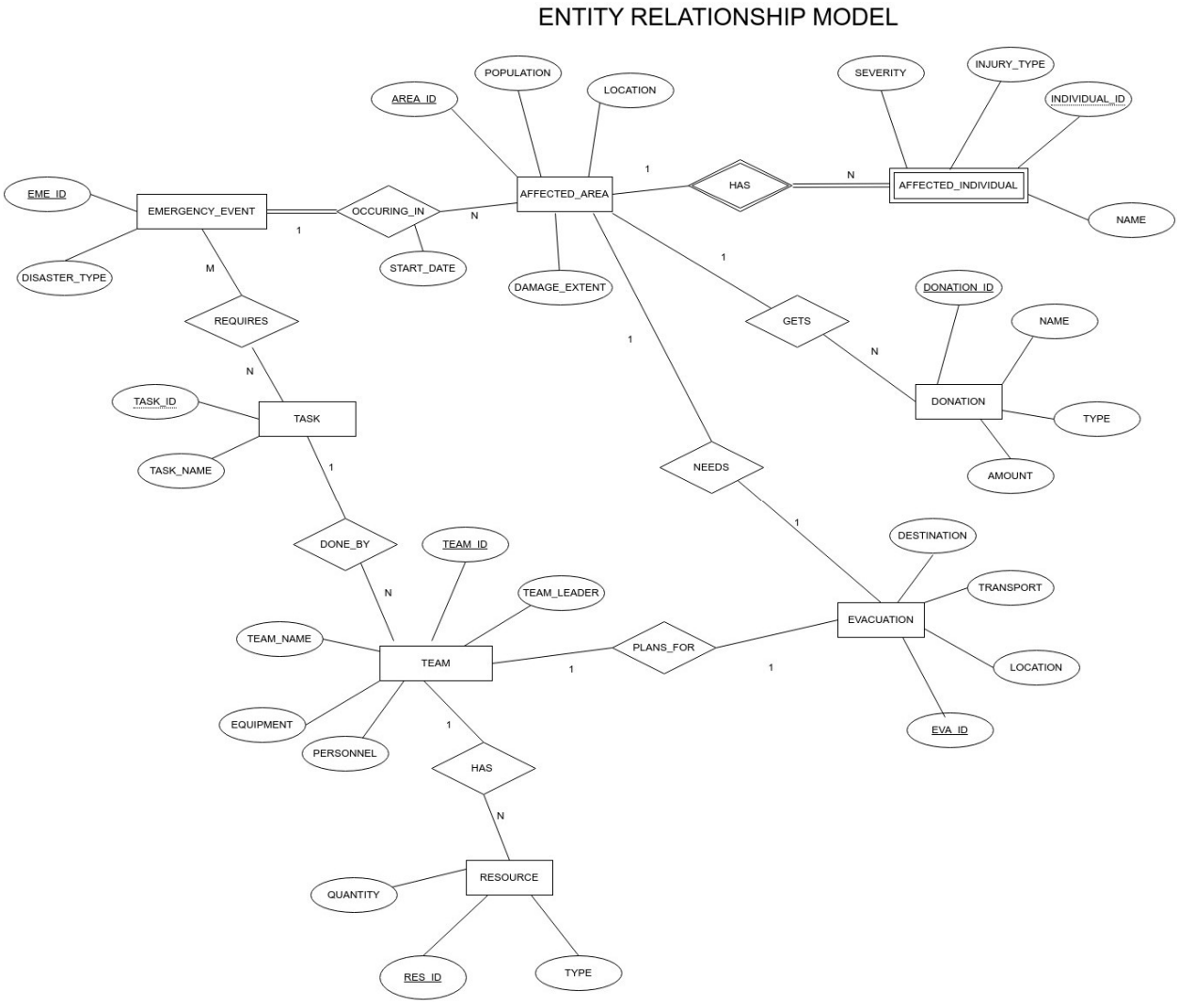
Question 3: Draw **alternate** Entity-Relationship Diagram illustrating the information you have identified in Question 1 that you think are most likely to occur.



Question 4: Choose the **optimal** Entity-Relationship Diagram from the designs provided above and justify why you think this is an optimal solution for your identified problem specification.

1.We have identified some more attributes to the entities which are important to related to the system.

2.We have mostly covered all the information which will be needed.



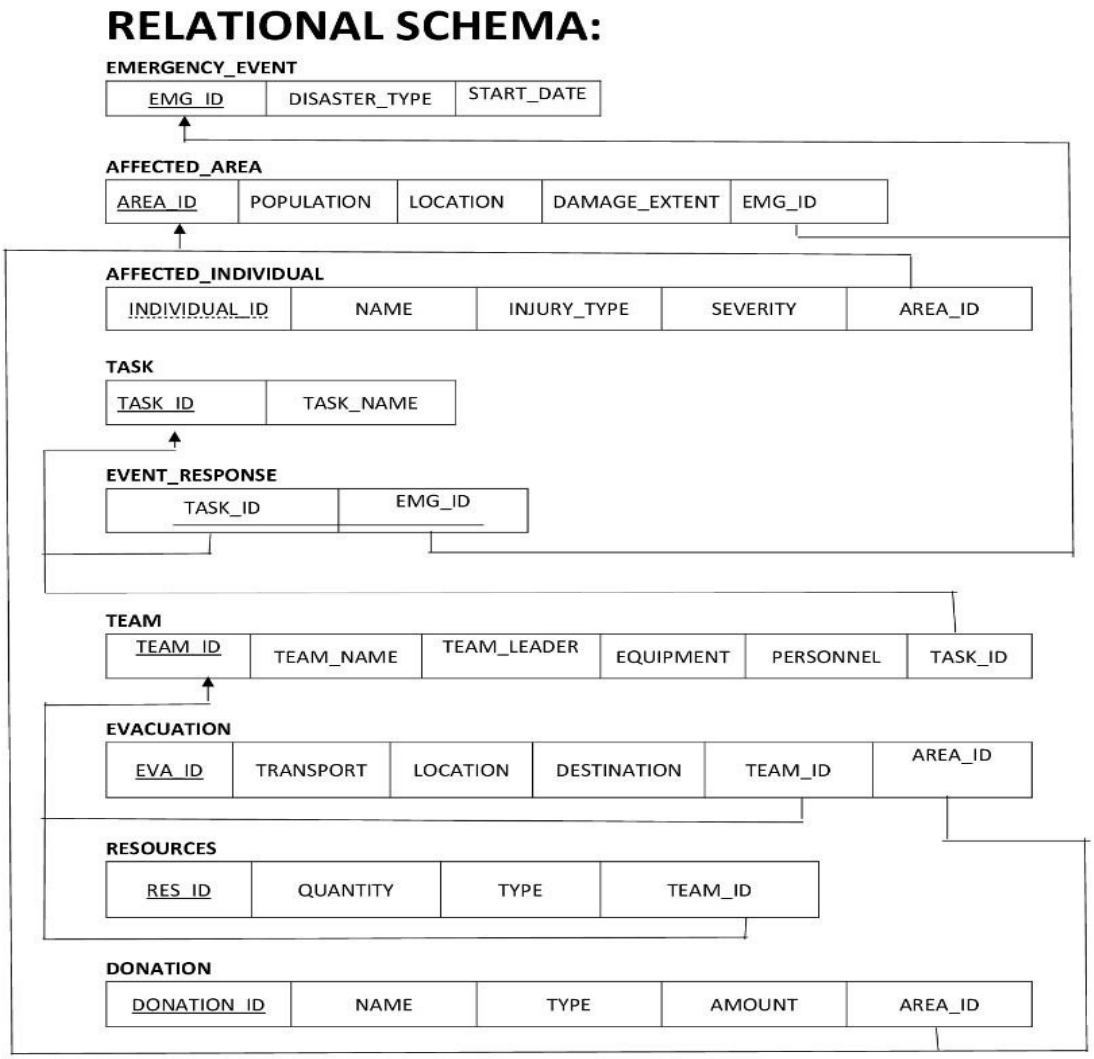
Entities and attributes:

EMERGENCY_EVENT	EMG_ID	DISASTER_TYPE	START_DATE		
AFFECTED_AREA	AREA_ID	POPULATION	LOCATION	DAMAGE_EXTENT	
AFFECTED_INDIVIDUAL	INDIVIDUAL_ID	NAME	INJURY_TYPE		
TASK	TASK_ID	TASK_NAME			
TEAM	TEAM_ID	TEAM_NAME	TEAM_LEADER	PERSONNEL	EQUIPMENT
EVACUATION	EVA_ID	TRANSPORT	LOCATION	DESTINATION	
RESOURCE	RES_ID	QUANTITY	SUPPLIES	TYPE	
DONATION	DONATION_ID	NAME	TYPE	AMOUNT	

Relationship between entities and cardinality ratio:

Entity 1	Relation name	Entity 2	Cardinality ratio
EMERGENCY_EVENT	OCCURING_IN	AFFECTED_AREA	1: N
AFFECTED_AREA	HAS	AFFECTED_INDIVIDUAL	1: N
EMERGENCY_EVENT	REQUIRES	TASK	M: N
TASK	DONE_BY	TEAM	1: 1
TEAM	PLANS_FOR	EVACUATION	1: 1
TEAM	HAS	RESOURCE	1: N
AFFECTED_AREA	GETS	DONATION	1: N
AFFECTED_AREA	NEEDS	EVACUATION	1:1

Question 6: Draw an ER to Relation Mapping illustrating the information you have identified in Question 4.



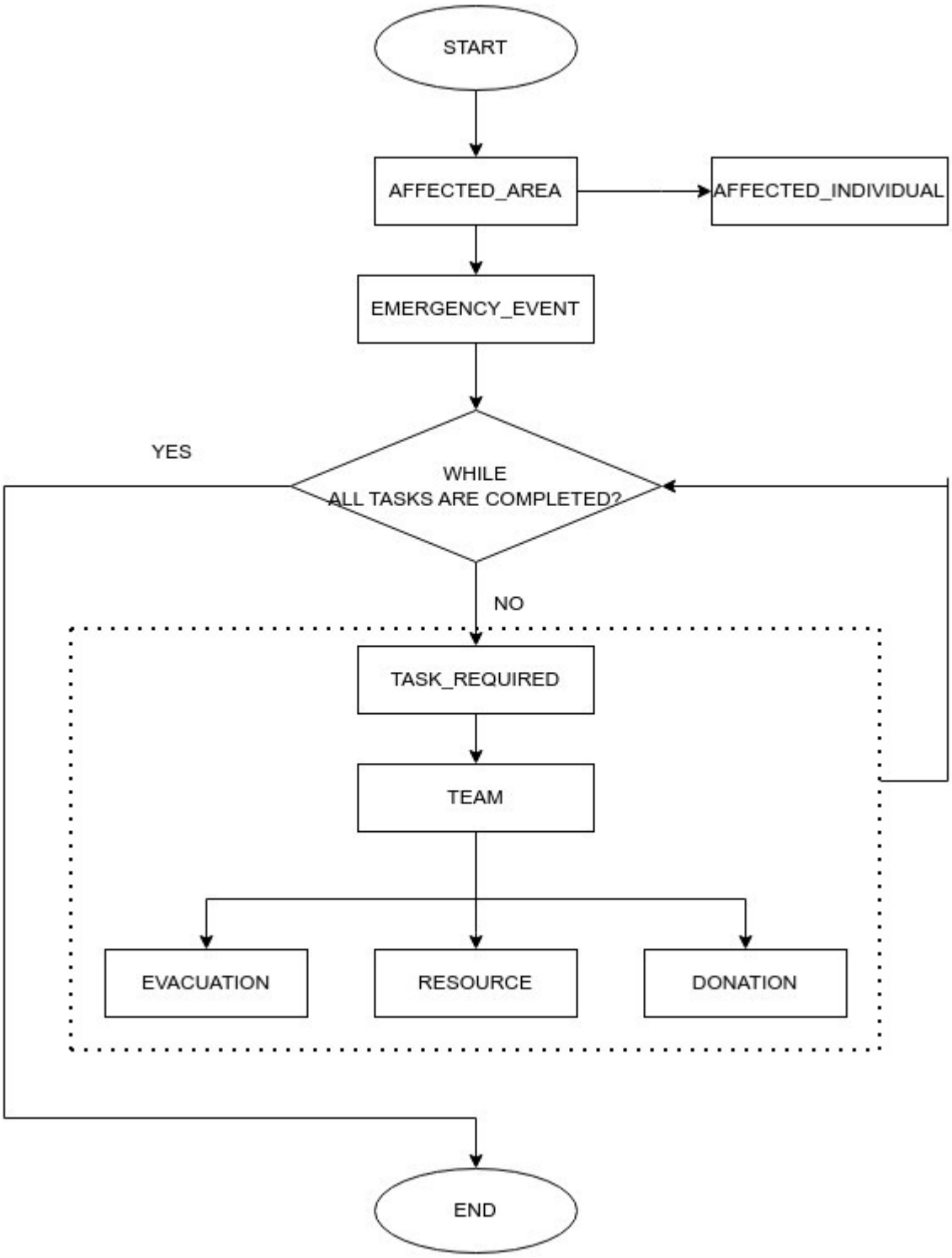
Question 7: Draw a Data Dictionary illustrating the information you have identified in Question 6.

Object (Entity)	Name (Attribute)	Type (Data type)	Description	Primary Key	Foreign Key
EMERGENCY_ EVENT	EMG_ID	integer	Unique identification number of event	YES	NO
	DISASTER_TYPE	varchar	Name of disaster	NO	NO
	START_DATE	date	Disaster starting time	NO	NO
AFFECTED_AREA	AREA_ID	integer	Unique identification number of area	YES	NO
	POPULATION	integer	Population of particular area	NO	NO
	LOCATION	varchar	Location name	NO	NO
	DAMAGE_EXTENT	varchar	Extent of damage caused	NO	NO
	EMG_ID	integer	Unique identification number of event	NO	YES
AFFECTED_INDIVIDUAL	INDIVIDUAL_ID	integer	Unique identification number of individual	YES	NO
	NAME	varchar	Name of injured person	NO	NO

	INJURY_TYPE	varchar	Type of injury	NO	NO
	SEVERITY	varchar	Extent of injury	NO	NO
	AREA_ID	integer	Unique identification number of area	NO	YES
TASK	TASK_ID	integer	Unique identification number of task required	YES	NO
	TASK_NAME	varchar	Name of the task to be performed	NO	NO
TEAM	TEAM_ID	integer	Unique identification number of team	YES	NO
	TEAM_NAME	varchar	Team name	NO	NO
	TEAM_LEADER	varchar	Team leader name	NO	NO
	EQUIPMENT	varchar	Name of equipment required	NO	NO
	PERSONNEL	integer	Number of persons	NO	NO
	TASK_ID	integer	Unique identification number of task to be done	NO	YES
EVACUATION	EVA_ID	integer	Unique identification number of evacuation	YES	NO
	TRANSPORT	varchar	Mode of transportation	NO	NO
	LOCATION	varchar	Name of location	NO	NO

	DESTINATION	varchar	Destination name	NO	NO
	TEAM_ID	integer	Unique identification number of team	NO	YES
	AREA_ID	integer	Unique identification number of affected area	NO	YES
RESOURSE	RES_ID	integer	Unique identification number of resource	YES	NO
	QUANTITY	integer	Quantity of resource available	NO	NO
	SUPPLIES	integer	Number of supplies	NO	NO
	TYPE	varchar	Type of resource	NO	NO
	TEAM_ID	integer	Unique identification number of team	NO	YES
DONATION	DONATION_ID	integer	Unique identification number of donation	YES	NO
	NAME	varchar	Name of person who is donating amount	NO	NO
	TYPE	varchar	Type of transaction	NO	NO
	AMOUNT	integer	Amount donated	NO	NO
	AREA_ID	integer	Unique identification number of area	NO	YES

Question 8: Draw a Data Flow Diagram illustrating the information you have identified in Question



Question 9: Normalization: Are all the relations in your chosen schema in 3NF? Are they in BCNF? Explain your answers. If any of your relations are not in BCNF, normalize them to BCNF. If you choose to normalize your relations only till 2NF or 3NF, explain your reasons (e.g., the amount of redundancy introduced is limited or some other valid reason).

EMERGENCY_EVENT:

(EMG_ID , DISASTER_TYPE,START_TIME)

- The Relation is in 1NF as it has no attributes that can hold only multiple values. The attributes in the relation can hold only atomic values.
- The Relation is in 2NF as the primary key contains only one attribute. Hence, every attribute is fully functionally dependent on the key.
- We observe that there is no transitivity in functional dependencies for the given relation. Hence the relation is in 3NF.
- Similarly, it is in BCNF as there exists no non-key attribute that determines another nonkey attribute.

AFFECTED_AREA:

(AREA_ID, POPULATION, LOCATION, DAMAGE_EXTENT, EMG_ID)

- The Relation is in 1NF as it has no attributes that can hold only multiple values. The attributes in the relation can hold only atomic values.
- The Relation is in 2NF as the primary key contains only one attribute. Hence, every attribute is fully functionally dependent on the key.
- We observe that there is no transitivity in functional dependencies for the given relation. Hence the relation is in 3NF.
- Similarly, it is in BCNF as there exists no non-key attribute that determines another nonkey attribute.

AFFECTED_INDIVIDUAL:

(INDIVIDUAL_ID, NAME, INJURY_TYPE, SEVERITY, and AREA_ID)

- The Relation is in 1NF as it has no attributes that can hold only multiple values. The attributes in the relation can hold only atomic values.
- The Relation is in 2NF as the primary key contains only one attribute. Hence, every attribute is fully functionally dependent on the key.
- We observe that there is no transitivity in functional dependencies for the given relation. Hence the relation is in 3NF.
- Similarly, it is in BCNF as there exists no non-key attribute that determines another nonkey attribute.

TEAM:

(TEAM_ID, TEAM_NAME, EQUIPMENT, and PERSONNEL.)

- The Relation is in 1NF as it has no attributes that can hold only multiple values. The attributes in the relation can hold only atomic values.
- The Relation is in 2NF as the primary key contains only one attribute. Hence, every attribute is fully functionally dependent on the key.
- We observe that there is no transitivity in functional dependencies for the given relation. Hence the relation is in 3NF.
- Similarly, it is in BCNF as there exists no non-key attribute that determines another nonkey attribute.

TASK:

(TASK_ID, TASK_NAME)

- The Relation is in 1NF as it has no attributes that can hold only multiple values. The attributes in the relation can hold only atomic values.
- The Relation is in 2NF as the primary key contains only one attribute. Hence, every attribute is fully functionally dependent on the key.
- We observe that there is no transitivity in functional dependencies for the given relation. Hence the relation is in 3NF.

- Similarly, it is in BCNF as there exists no non-key attribute that determines another nonkey attribute.

EVACUATION:

(EVA_ID, TRANSPORT, LOCATION, DESTINATION,AREA_ID and TEAM_ID)

- The Relation is in 1NF as it has no attributes that can hold only multiple values. The attributes in the relation can hold only atomic values.
- The Relation is in 2NF as the primary key contains only one attribute. Hence, every attribute is fully functionally dependent on the key.
- We observe that there is no transitivity in functional dependencies for the given relation. Hence the relation is in 3NF.
- Similarly, it is in BCNF as there exists no non-key attribute that determines another nonkey attribute.

RESOURCE:

(RES_ID, QUANTITY, SUPPLIES_TYPE, and TEAM_ID)

- The Relation is in 1NF as it has no attributes that can hold only multiple values. The attributes in the relation can hold only atomic values.
- The Relation is in 2NF as the primary key contains only one attribute. Hence, every attribute is fully functionally dependent on the key.
- We observe that there is no transitivity in functional dependencies for the given relation. Hence the relation is in 3NF.
- Similarly, it is in BCNF as there exists no non-key attribute that determines another nonkey attribute.

DONATION:

(DONATION_ID, NAME, TYPE, AMOUNT, and AREA_ID)

- The Relation is in 1NF as it has no attributes that can hold only multiple values. The attributes in the relation can hold only atomic values.
- The Relation is in 2NF as the primary key contains only one attribute. Hence, every attribute is fully functionally dependent on the key.
- We observe that there is no transitivity in functional dependencies for the given relation. Hence the relation is in 3NF.
- Similarly, it is in BCNF as there exists no non-key attribute that determines another nonkey attribute.

Question 10: Choose the **optimal** normalized schema from Question 9 and justify why you think this is an optimal solution.

ANS:

All relations in the given database are present in BCNF so redundancy is very low so, the given solution is an optimal solution for given problem.

Submission date: 14 March 2023