- 1. Specify the following queries on the COMPANY relational database schema shown in Figure 5.5 using the relational operators discussed in this chapter.
  - A. List the names of all employees who have a dependent with the same first name as themselves.

σDname=Dependent\_name(DEPENDENT\*EMPLOYEE)

B. Retrieve the names of all employees that work on every project.

 $\pi_{Fname}(EMPLOYEE*(WORKS_ON \div \rho_{(Pno)}(\pi_{Pnumber}(PROJECT)))))$ 

C. Retrieve the average salary of all female employees.

 $\mathcal{F}_{\text{AVERAGE Salary}}(\sigma_{\text{Sex}='\text{female'}}(\text{EMPLOYEE}))$ 

D. List the last names of all department managers who have no dependents.

 $\pi_{Lname}((\pi_{Mgr\_ssn}(DEPARTMENT)-\pi_{Mgr\_ssn}(DEPARTMENT)))$   $\bowtie_{Ssn=Mgr\_ssn}EMPLOYEE)$ 

<b>EMPLOY</b>	EE								
Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
DEPART	MENT								
Dname	Dnumb	<u>ber</u> Mgr	_ssn   I	Mgr_start_	date				
DEPT_LC	CATION	S							
Dnumb	er Dloc	cation							
PROJEC	Т								
Pname	Pnumb	oer Ploo	ation	Dnum	]				
WORKS.	ON								
Essn	<u>Pno</u>	Hours						_	
DEPEND	ENT							S	igure 5.5 chema diagram for the
Essn	Depend	lent_name	Sex	Bdate	Relations	ship			OMPANY relational atabase schema.

2. Specify query 1C using QBE format.

## **EMPLOYEE**

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ ssn	Dno
						female	P.AVG.		

- 3. Consider the AIRLINE relational database schema shown in Figure 5.8. Specify the following queries in relational algebra:
  - A. List all fare information for flight number 'co197'.

$$\sigma_{Fare\_code='co197'}(FARE)$$

B. List the flight numbers and weekdays of all flights or flight legs that depart from Houston Intercontinental Airport (airport code 'iah') and arrive in Los Angeles International Airport (airport code 'lax').

 $\pi Flight\_number, Weekdays (\sigma Departure\_airport\_code='iah', Arrival\_airport\_code='lax' (FLIGHT*FLIGHT\_LEG))$ 

C. Retrieve the number of available seats for flight number 'co197' on '2009-10-09'.

 $\pi_{\text{Number\_of\_available\_seats}}(\sigma_{\text{Flight\_number='co197'}}, Date='2009-10-09'(LEG\_INSTANCE))$ 

AIRPORT			
Airport_code Name City S	itate		
FLIGHT Flight_number   Airline   Weekda	ys		
FLIQUE LEG			
FLIGHT_LEG Flight_number Leg_number	Departure airport code	Scheduled	departure_time
0 = 0	Arrival airport cod		ed arrival time
	Arrivai_airport_cod	ie Scriedui	ed_arrival_time
LEG_INSTANCE			
Flight_number Leg_number	Date Number_of_availa	ble_seats A	irplane_id
Departure_airport_code	Departure_time Arriv	val_airport_code	Arrival_time
FARE			
Flight_number Fare_code A	mount Restrictions		
AIRPLANE_TYPE Airplane_type_name   Max_seats	0		
Airplane_type_name Max_seats	Company		
CAN_LAND			
Airplane_type_name Airport_code	e		
AIRPLANE			
Airplane_id Total_number_of_se	ats Airplane_type		
SEAT_RESERVATION	Data   Cast awarbas   4		
Flight_number Leg_number	Date Seat_number (	Customer_name	Customer_phone
gure 5.8 e AIRLINE relational database schema.			

4. Specify query 3C using QBE format. (replaced 2C with 3C. expected as error)

## LEG\_INSTANCE

Flight_ number	Leg_ number	Date	Number_of_ available_	Airplain_id	Departure_ airport_code	Departure_ time	Arrival_ airport	Arrival_ time
			seats		· -		code	
co197		2009-10-09	P.					

- 5. Specify the following queries in relational algebra on the database schema given in Exercise 5.14:
  - A. List the Order# and Ship\_date for all orders shipped from Warehouse #W2.

 $\pi_{Order\#, Ship\_date}(\sigma_{Warehouse\#='W2'}(SHIPMENT))$ 

B. Produce a listing Cname, No\_of\_orders, Avg\_order\_amt, where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.

 $\rho$ Cname, No\_of\_orders, Avg\_order\_amt(Cust# $\mathcal{F}$ COUNT Order#, AVERAGE Ord\_amt(CUSTOMER\*ORDER))

C. List the Order# for orders that were shipped from all warehouses that the company has in New York.

 $\pi_{Order\#}(\sigma_{City='New\ York'}(ORDER*SHIPMENT*WAREHOUSE))$ 

CUSTOMER(Cust#, Cname, City)
ORDER(Order#, Odate, Cust#, Ord\_amt)
ORDER\_ITEM(Order#, Item#, Qty)
ITEM(Item#, Unit\_price)
SHIPMENT(Order#, Warehouse#, Ship\_date)
WAREHOUSE(Warehouse#, City)

6. Specify query 5B using QBE format.

## CUSTOMER

Cust#	Cname	City
_CUST	P.	

## ORDER

Order#	Odate	Cust#	Ord_amt
P.CNT.H("No_of_orders")	P.AVG.ALL.H("Avg_order_amt").	_CUST.G.	