

System Analysis & Design
Final Exam

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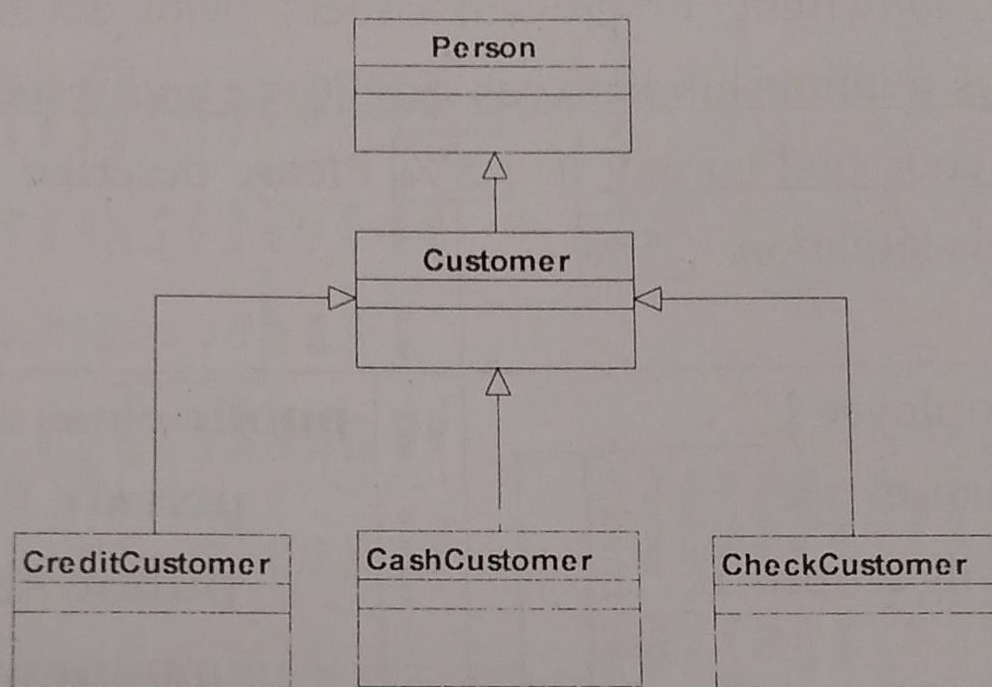
1. An Employee has an association with an Account object that tracks all the incomes and charges accrued from transactions. The Customer can call the operations of the Account object, but the Account never invokes operations of the ~~Customer~~^{Employee}. Since the reference to the Account object does not change over time, we need to do something to prevent callers from accidentally modifying the Account. What is relationship between Employee and Account? **2%** Please detect the error of the code and correct it. **5%** Please describe the aspects of the Law of Demeter in this situation. **5%**

<pre> public class Employee { private Account acc; private String empId; public Employee() { account=new Account(); } public Account getAccount() { return account; } public String getEmpId() { return empId; } public void setEmpId(String empId) { this.empId = empId; } } </pre>	<pre> public class Account { private Employee emp; public Account() { emp=new Employee(); } } </pre>	<p>LoD</p> <p>(1) 自己的方法</p> <p>(2) 父, 自己 attribute</p> <p>(3) 任入的参数</p> <p>(4) 自己 create 的</p>
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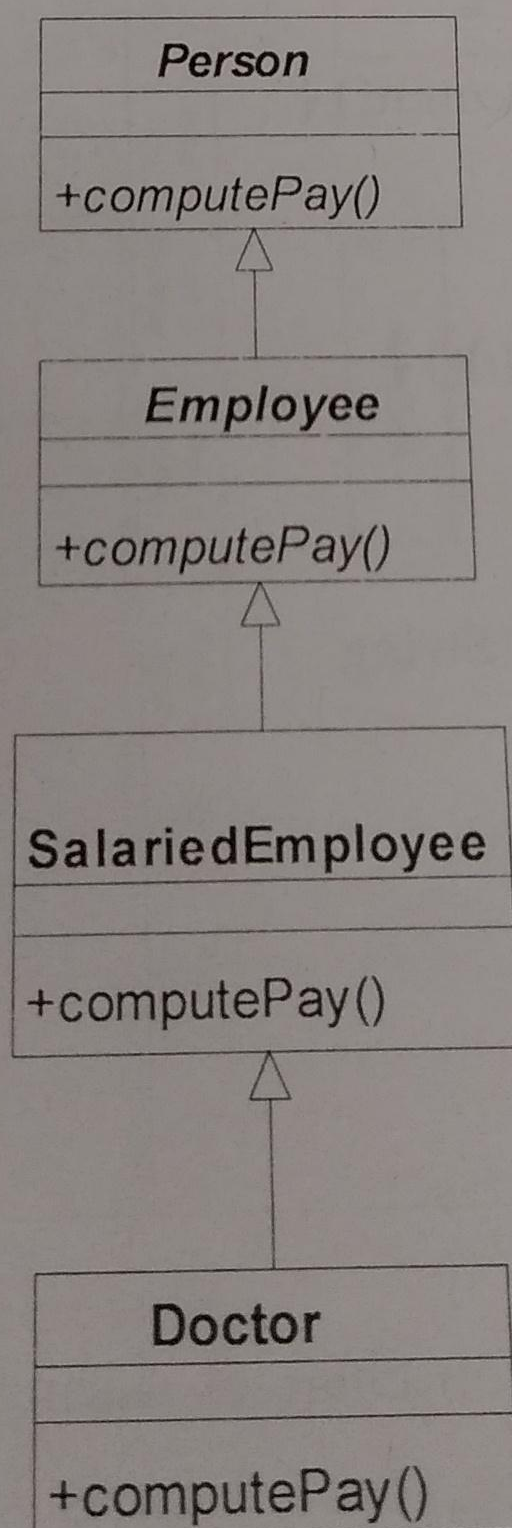
2. The direction of an association changes during the development of the system. Assume that we modify the Account class so that the display name of the Account is updated from the name of the Employee. In this situation, the

Account needs to access its corresponding Employee object. Therefore, we plan to add an owner attribute to Account. We need to ensure that if a given Account has a reference to a specific Employee, and the Employee has a reference to that same Account. Since neither the Employee class nor the Account class can modify the field anywhere else, this ensures that both reference attributes remain consistent. What is relationship between Employee and Account? **2%** Please write the Java code. **8%**

3. From a cohesion, coupling, and connascence perspective, is the following class diagram a good model? Why or why not? **5%**



4. From inheritance perspective, is the following class a good model? Why or why not? **5%**



5. Preconditions and postconditions can be used to specify dependencies among operations in the same class. Please select the right statement for the following situations. **8%**

- 1) To ensure that we invoke TournamentControl to select sponsor only once. 4
- 2) To assume that the Player is not yet part of the Tournament of interest. 1
- 3) To ensure that sponsors cannot be selected before there are interested advertisers. 2
- 4) To specify how TournamentControl sets the advertisers association when select sponsor. 3

context TournamentControl::IsPlayerOverbooked(p) **pre:**
not p.tournaments->includes(self.tournament)

(1)

context TournamentControl::selectSponsors (advertisers) **post:**
tournament.sponsors->sponsors.equals(advertisers)

(2)

context TournamentControl::selectSponsors (advertisers) **pre:**
interestedSponsors->notEmpty()

(3)

context TournamentControl::selectSponsors (advertisers) **pre:**
tournament.sponsors->isEmpty()

(4)

6. Specify a precondition for renew() of a Membership class. **2%** Draw the activity diagram based on the following renew() algorithm specification. **3%**

```

1. result ← PaymentProcessor.pay()
2. if result = true, then
3.   expirationDate ← today + membershipDuration
4.   status ← active
Return the value of result

```

7. The following table is to describe the steps of withdraw money use case. Please draw the sequence diagram. **10%**

#	Subject	Subject Action	Parameters	Object Acted Upon
3.	Customer	enters	<i>amount</i>	ATM GUI
4.1.	ATM GUI	withdraws	<i>amount</i>	withdraw money controller.
4.2.	withdraw money controller	verifies	<i>amount</i>	account.
4.3.	account	returns	true or false to	withdraw money controller.
4.4.	If true is returned then			message.
4.4.1.	withdraw money controller	creates	<i>amount</i>	dispenser
4.4.2.	withdraw money controller	dispense	<i>amount</i>	account.
4.4.3.	withdraw money controller	deducts	<i>amount</i>	database manager.
4.4.5.	withdraw money controller	saves	<i>account</i>	
4.4.3.	else			message
4.4.4.	withdraw money controller	creates	"funds are insufficient to fulfill request."	
4.5.	withdraw money controller	returns	<i>message</i>	ATM GUI.
4.6.	ATM GUI	displays	<i>message</i>	customer.

8. There are six types of interaction cohesion including functional, sequential, communicational, procedural, temporal or classical, logical, and coincidental. Please state the type of cohesion for the following situations.

1) A system initialization routine: this routine contains all of the code for initializing all of the parts of the system. Lots of different activities occur, all at the initial time. temporal 2%

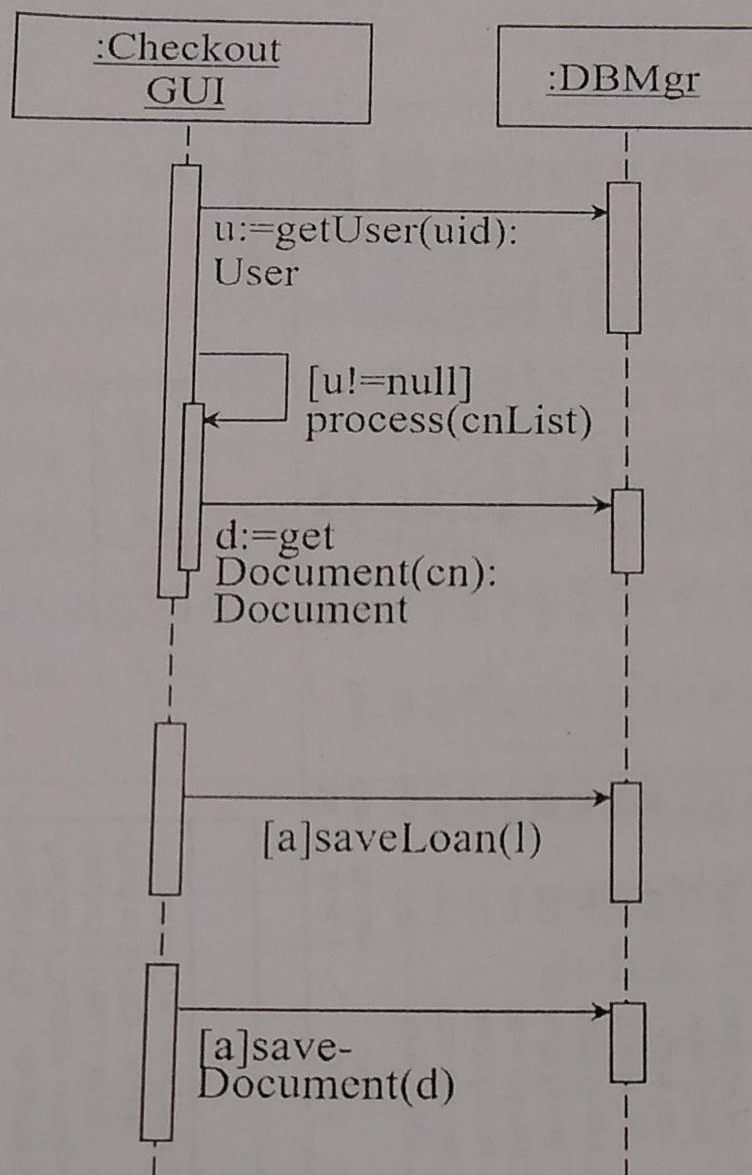
2) An object "calculate totals" may keep a running total of the quantity times price subtotal for each item. 2%

9. Please use an example to specify a method's algorithm for a compute pay method associated with an hourly employee class using an activity diagram. The procedure should include recognition of employee status, the check for hourly employment, calculate the number of hours worked, calculate tax, and the printing of check. 5%

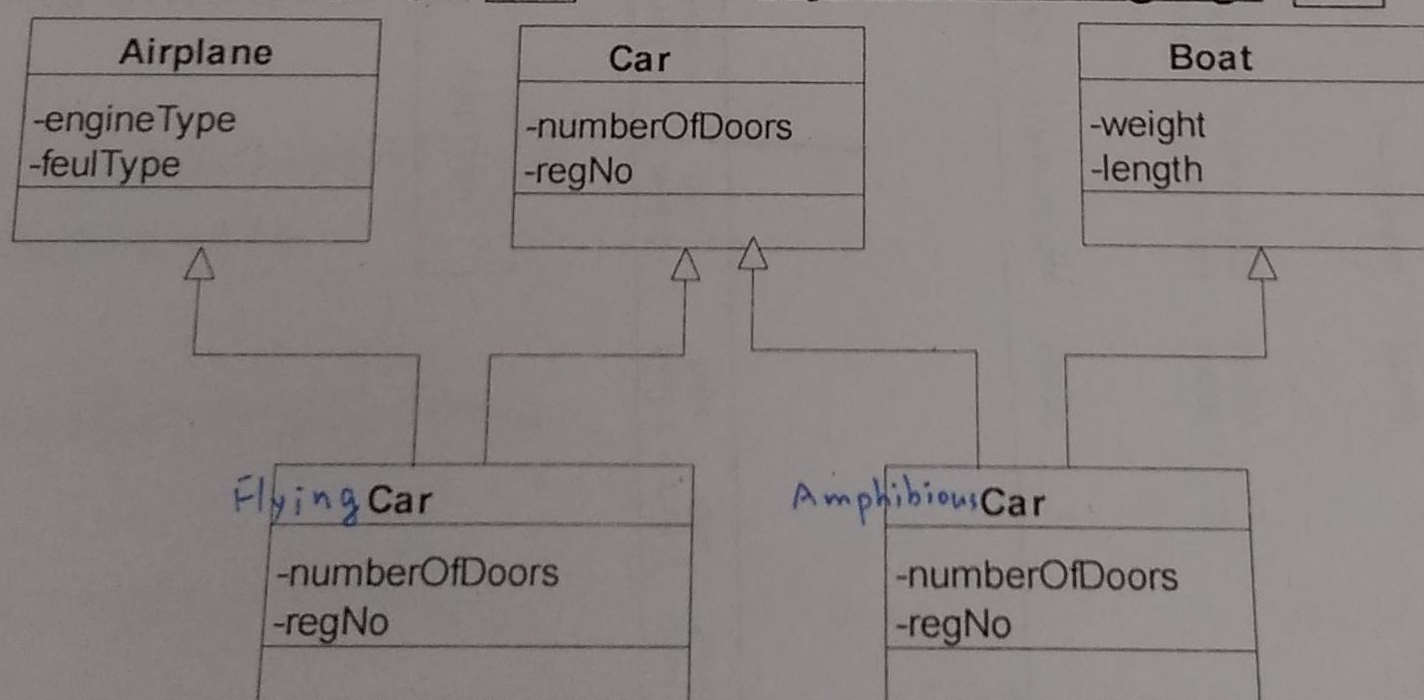
10. Please use an example to illustrate each notation 4%.

Notation	Meaning
	A named instance without a type, the type is not important, unknown, or to be determined at run time
	An unnamed instance with a type, the name is not important, or not used elsewhere in the sequence diagram

11. Please indicate the commonly seen mistake for the following sequence diagram. 5%



12. Please use rule 1a and 1b factor out multiple inheritance effect for a single-inheritance language. 6% and an object-based language. 6%



13.
12. Given the following Order figure displaying redundant data and null cells in the file. Please use normalization rule to create first normal form, second normal form, and third normal form for it. Please also add necessary attributes to the normalized form. You need to identify primary and foreign keys and explain what referential integrity is. **15%**

Order	
-Order Number : unsigned long	
-Date : Date	
-Cust ID : unsigned long	
-Last Name : String	
-First Name : String	
-State : String	
-Tax Rate : float	
-Product 1 Number : unsigned long	
-Product 1 Desc. : String	
-Product 1 Price : double	
-Product 1 Qty. : unsigned long	
-Product 2 Number : unsigned long	
-Product 2 Desc. : String	
-Product 2 Price : double	
-Product 2 Qty. : unsigned long	
-Product 3 Number : unsigned long	
-Product 3 Desc. : String	
-Product 3 Price : double	
-Product 3 Qty. : unsigned long	

Null Cells

Order Number	Date	Cust ID	Last Name	First Name	State	Tax Rate	Prod. 1 Number	Prod. 1 Desc.	Prod. 1 Price	Prod. 1 Qty.	Prod. 2 Number	Prod. 2 Desc.	Prod. 2 Price	Prod. 2 Qty.	Prod. 3 Number	Prod. 3 Desc.	Prod. 3 Price	Prod. 3 Qty.
239	11/23/00	1035	Black	John	MD	0.05	555	Cheese Tray	\$45.00	2								
260	11/24/00	1035	Black	John	MD	0.05	444	Wine Gift Pack	\$60.00	1								
273	11/27/00	1035	Black	John	MD	0.05	222	Bottle Opener	\$12.00	1								
241	11/23/00	1123	Williams	Mary	CA	0.08	444	Wine Gift Pack	\$60.00	1								
262	11/24/00	1123	Williams	Mary	CA	0.08	222	Bottle Opener	\$12.00	2								
287	11/27/00	1123	Williams	Mary	CA	0.08	222	Bottle Opener	\$12.00	2								
290	11/30/00	1123	Williams	Mary	CA	0.08	222	Bottle Opener	\$12.00	2								
234	11/23/00	2242	DeBerry	Ann	DC	0.065	555	Cheese Tray	\$45.00	3								
237	11/23/00	2242	DeBerry	Ann	DC	0.065	555	Cheese Tray	\$45.00	2								
238	11/23/00	2242	DeBerry	Ann	DC	0.065	111	Wine Guide	\$15.00	1								
245	11/24/00	2242	DeBerry	Ann	DC	0.065	444	Wine Gift Pack	\$60.00	1								
250	11/24/00	2242	DeBerry	Ann	DC	0.065	222	Bottle Opener	\$12.00	1								
252	11/24/00	2242	DeBerry	Ann	DC	0.065	222	Bottle Opener	\$12.00	1								
253	11/24/00	2242	DeBerry	Ann	DC	0.065	222	Bottle Opener	\$12.00	1								
297	11/30/00	2242	DeBerry	Ann	DC	0.065	222	Bottle Opener	\$12.00	1								
243	11/24/00	4254	Bailey	Ryan	MD	0.05	333	Jams & Jellies	\$20.00	1								
246	11/24/00	4254	Bailey	Ryan	MD	0.05	555	Cheese Tray	\$45.00	2								
248	11/24/00	4254	Bailey	Ryan	MD	0.05	333	Jams & Jellies	\$20.00	3								
235	11/23/00	9500	Chin	April	KS	0.05	222	Bottle Opener	\$12.00	1								
242	11/23/00	9500	Chin	April	KS	0.05	222	Bottle Opener	\$12.00	1								
244	11/24/00	9500	Chin	April	KS	0.05	333	Jams & Jellies	\$20.00	3								
251	11/24/00	9500	Chin	April	KS	0.05	222	Bottle Opener	\$12.00	2								