

### Specimen Examination Questions

**All these questions have been taken from past examination papers.**

**They indicate style and depth .**

1.

- (a) Explain the steps involved in developing a use case diagram and When to use the Use case diagram.
- (b) Easy Travel Singapore, ETS, is a corporation that makes car reservations and rental wants to build a system for its operation. ETS has many rental locations in the region. The operation includes vehicle reservation, vehicle pickup, preparation of contract and returning vehicle. Renter makes reservation for vehicles and the reservation is taken by booking clerk in the booking office. The booking clerk register the information that includes, pick up location with date and time, return location with date and time, vehicle type required (car, van, ...). Renters name, phone number and renter's club number, address Valid booking order is allotted a unique reservation number and the renter is informed about the same. The ETS corporation keeps a club for frequent renters. For each member the following data are stored. Name, address phone number, driving license number, member ship number, preference about a type of vehicle. A vehicle is identified by the vehicle number, model, year, manufacturer, mileage and vehicle type. When the vehicle is picked up the details of the renter, name, address, phone number, club membership, number (if any) and driving license number. The rental rate for different vehicles are fixed. When a vehicle is rented a contract is issued which includes the booking details as registered earlier and the vehicle rented, payment type (cash, credit card, corporate account ...). The available vehicle is assigned from the inventory. When the vehicle is returned, as per the actual date and time of return, bill is prepared for the actual charge.

Produce a use case model for the process of making reservation

2.

A computer service centre services computers and replaces faulty parts. The service centre is a part of a chain of similar service centres. Customers bring computers to the service centre for repair and a reception technician makes an estimate. If customer agrees, the computer is assigned to repair technician, who keeps a repair event document. All the repair event documents for a computer are collected in its repair log. A repair event may be suspended because of lack of spare parts or other reasons.

- a) Draw the UML class diagram (give two attributes and an operation for each class)
- b) Draw a sequence diagram for receiving the computers for service, assigning repair jobs to the repair technician and maintaining a report log

*The next two questions are based on the following case study:*

The newly designed Al Ybi Palace Hotel will have 21 floors that are served by 5 lifts. On each floor (except the bottom and top floors) there will be two call buttons for the lifts, one for people wishing to go Up and one for people wishing to go Down. On each of the bottom and top floors there will be only one call button. These will be to go Up (from the bottom floor) or Down (from the top floor).

On each floor above the doors of each lift are to be two indicator lights one pointing up and one down. Once a potential passenger presses a summoning button, the lift that is going to answer that summons will identify itself by illuminating the appropriate indicator light above its door. That lift will then ignore any other summonings until it has collected its passenger(s). Once the lift is within two floors of the potential passenger, that indicator light will flash on and off until the lift arrives and the doors open. As the doors close again the indicator light will be turned off.

In each lift there will be numbered buttons for each floor of the hotel. The passenger will select their destination by pressing the appropriate button. Once a lift is in motion with a passenger aboard, it will only stop at an intermediate floor if there is a request from an onboard passenger or there is a request from a potential passenger wishing to travel in the same direction. Each lift has a floor sensor that can identify the total weight present in the lift. If that weight reaches 800 kg an alarm will sound and the lift will not move until the weight is decreased.

The lifts are to be controlled by a computer system.

3. By identifying classes and their attributes, linking structures and associations, build and draw a Class Model for the lift control system.
4. The system includes a use case *Summon a lift*. Identify three other use cases for the case study. (Include a use case *Summon a lift*). Draw a use case diagram showing these use cases including *Summon a lift*, and any actors that are involved.

(a) Draw a collaboration diagram for the use case *Summon a lift*.

(b) Suggest suitable operations for the object types identified in question 3.

*The next two questions are based on the following case study:*

The Bank of Al Gebra has asked you to design a computer-based system to hold details of its dealings on the Ankh-Morpork Stock Exchange, and provided you with the following details:-

The Ankh-Morpork Stock Exchange is a market for the purchase and sale of securities. Securities come in two major forms: stocks and shares. A stock, sometimes known as a gilt-edged security or gilt, is a security with an associated interest rate. The most important type of stock are government bonds. Shares are a type of security which pay no interest, but pay a dividend to shareholders at regular intervals. Shares are normally issued by companies to raise capital.

All securities are initially placed on the stock market at an issue price: a price in pence per share. Once a share has been issued it can be traded: that is, bought and sold on the stock market.

Persons or institutions which deal in securities on the stock market are known as financial intermediaries. There are two main types of financial intermediary: brokers and marketmakers. The Bank acts as both marketmaker and broker.

Securities are bought from certain registered marketmakers. Marketmakers are normally financial institutions that opt to deal in a limited number of securities. The collection of such securities held by a marketmaker is known as the marketmakers' 'book'.

Each marketmaker will define the state of each type of security it holds in terms of two prices: the offer price and the bid price. The offer price is the price a market-maker is willing to sell a security; the price at which an investor will buy. The bid price is the price a marketmaker is willing to pay for a security; the price at which an investor can sell to him. The difference between the two prices is known as the marketmakers' 'spread'. Different marketmakers will quote different spreads on stocks and shares depending on the state of their book. For example:

Dibler's Convenience Foods		
	Marketmaker A	Marketmaker B
Offer	102	103
Bid	100	101

Brokers act as intermediaries between investors and marketmakers. Brokers purchase securities on behalf of investors, and/or sell securities to marketmakers on behalf of an investor. On both such transactions brokers normally charge a commission, normally a percentage of each share price.

Under the recent reorganisation of the market, marketmakers may also act in the capacity of brokers.

To conduct a deal, an investor issues a broker with an order specification. Such a specification normally includes:

1. The name of the security.
2. Whether the order is to purchase or sell securities.
3. The size of an order.
4. The time for which the order is to remain outstanding. Day orders should terminate at the end of day's trading; open orders remain in force until filled by a broker or cancelled by an investor.
5. Type of order. A market order indicates that the broker should get the best price at the time; a limit order specifies a price below which the broker should buy or above which the broker should sell.

5. By identifying classes and their attributes, linking structures and associations, build and draw a Class Model for the stock market system.
6. (a) The system includes a use case "Purchase Securities for Investor". Identify three other use cases for the case study. Draw a use case diagram showing these use cases, including "Purchase Securities for Investor", and any actors that are involved.  
  
(b) Draw a sequence diagram for the use case "Purchase Securities for Investor". Show the message names on your diagram.

*The next two questions are based upon the following case study.*

#### Case Study - Amalgamated Journals

Amalgamated Journals (AJ) currently publishes a family of ten magazines and has plans to start up several new magazines in the future. AJ intends to use a computerized system for maintaining subscription records.

For each magazine subscription the following information is kept: subscriber number, name, address, magazine name, date of expiry of subscription, length of subscription. Note that one person who has three different magazine subscriptions will have three unrelated subscription entries. For each magazine published by AJ the following information is kept: magazine name, subscription length (the number of months a subscription can run), subscription price (for the number of months just specified). The last two data items can occur a variable number of times, for example a six month subscription to Tree Fanciers Weekly is £25, but a year's subscription is only £40.

To start a new subscription, the subscriber supplies his or her name, address, the name of the magazine and the desired length of subscription. The subscriber does not pay for the subscription now; instead the system bills him or her for it later. The system obtains the magazine number and checks that the subscription length is one of the allowed subscription lengths.

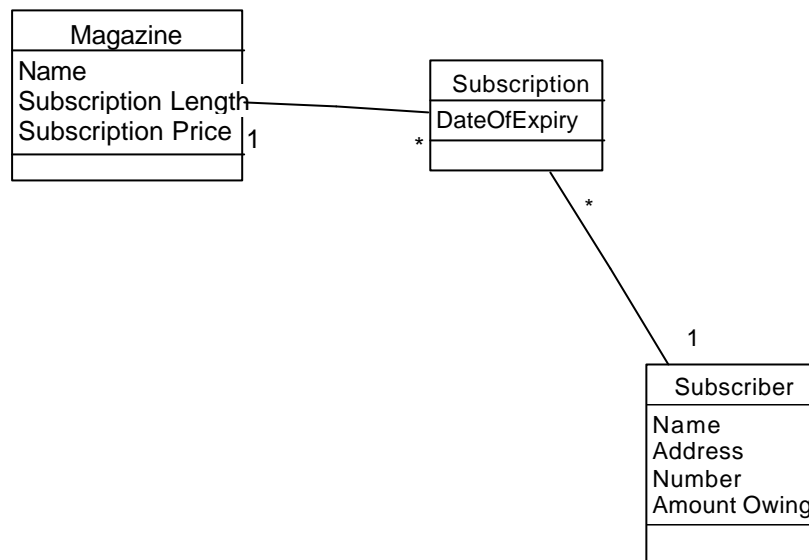
Once each month, the system runs through all the subscribers and issues a bill to every subscriber who owes money. At the same time the billing report for the financial director is produced which contains a complete listing of all bills despatched.

A payment from a subscriber will be accompanied by a copy of the bill. After verification of the payment the subscriber records will be amended.

Once each month, a mailing label, with subscriber name, address and magazine number, is produced for every subscriber with an unexpired subscription to any of AJ's magazines. The labels are sent to the shipping department, which puts the labels on the magazines before mailing

At the moment, no other functions are to be undertaken by the system.

An initial object-oriented analysis has been carried out and the classes and their attributes shown in the diagram below have been identified:



7.

(a) Name FOUR possible use cases for the AJ system

(b) Draw a use case diagram showing those use cases and any relevant actors.

(c) For ONE of the use cases you have identified in part (a), produce a collaboration diagram.

8.

(a) The following candidate classes were rejected by the analyst:

Amalgamated Journals  
Financial Director  
Mailing Label  
Billing Report  
Expired Subscription

Give reason(s) why each one should have been rejected.

(b) One of the junior analysts on the team thought that the attributes:  
subscriber number,  
subscriber name,  
subscriber address,  
magazine name,  
length of subscription

should have been included in the class *Subscription*. However the Senior Analyst overruled him. For each of the attributes above give a reason to support the decision of the Senior Analyst.

- (c) Using examples drawn from the case study, explain the difference between *object*, *class* and *extension*.

9. It is claimed that using Object-Oriented Analysis and Design provides significant benefits over other approaches to Analysis and Design. Your manager has a number of projects that she wishes to have examined with a view to computerization.

Amongst these are:-

a complete accounts receivable system

a stock control system

the payroll system

an office diary system for 30 people to run over a LAN.

Write a report to her which examines the advantages and disadvantages of a possible usage of Object-Oriented Analysis and Design in three of these areas and recommends for each chosen application whether to adopt Object-Oriented Analysis and Design or to use a Structured Analysis and Design methodology.