Tutorial 2: Introduction to Information Systems

Question 1

An information system is said to have five main *components*, namely: hardware, software, stored data, people and processes.

Identify all the five main components for each of the following information systems. (Note that each of the components is expected to contain a number of items).

- Auto Teller System
- Point of Sales (POS) System

	Auto Teller System	POS System
Hardware	• **Server** – mainframe • **Client** – PC, ATM, Printer • **Network Infrastructure** – modem, hub, router	• **Server** – mainframe • **Client** – PC, POS Terminal, Card Reader, Printer • **Network Infrastructure** – modem, hub, router
Software	• **Server OS** – Unix, Client OS (Windows 10) • **DBMS** – Oracle • **Application** – Auto Teller System	• **Server OS** – Unix, Client OS (Windows 10) • **DBMS** – Oracle • **Application** – POS System
Processes	• Check balance • Withdraw money • Deposit money/cheques • Transfer money • Make payment • Print receipt	• Check prices • Scan items • Total sales • Verify cards • Update bonus points • Print receipt
Data Stored	• **Master files** – customer, account • **Transaction files** – withdrawal, deposit, transfer, payment	• **Master files** – customer, membership • **Transaction file** – sales, stock, loyalty point
People	• Customers • Bank tellers • Bank staffs	• Customers • Member • Sales staffs • Purchasing staffs

Question 2

Manufacturing firm is one of the many types of organization in the business world. Systems used in a manufacturing firm are for purposes of supporting their business processes or functions.

Required:

(a) Identify 5 systems (or modules) commonly used in a typical manufacturing firm.

- **Core system**
  - Purchasing System
  - Production System
  - Inventory System
  - Sales System (Warehouse Management System)
- **Non-core system**
  - Human Resource System
  - Accounting System

(b) For any **ONE (1)** of the systems identified in (a) above, list **any FOUR (4)** related subsystems (or sub-modules) involved.

- **Inventory System (Sales System)**
  - Receive goods Subsystem (from suppliers)
  - Distribute/Deliver Goods Subsystem (to customers)
  - Issue/transfer Goods Subsystem (between internal warehouses)
  - Goods Returns (Inwards & Onwards) Subsystem
  - Stock-take Subsystem

(c) Briefly describe **2** major functions (features) for any **ONE (1)** of the subsystems in (b) above.

- **Functions/Features**
  - **Check availability of Purchase Order (PO)**
    - Allows warehouse staff to receive items delivered to the warehouse by the suppliers.
    - Before delivery, store-hands need to retrieve relevant PO from the system to check whether the order has been placed or not.
  - **Check quality**
    - Allows store-hands to check the quantity specifications indicated on the PO before receiving.
  - **Check quantity**
    - Allows store-hands to check the quantity ordered before

conducting both goods physical check and received goods count.

- **Partial delivery**
  - Allows quantity of a particular PO to be received a number of times from the supplier.
- **Outstanding PO**
  - Allows store-hands to check the amount outstanding not yet delivered for a particular PO.
- **Stock balance**
  - Allows relevant staffs such as sales staffs and purchasing staffs to conduct stock checks of the current stock balance in the warehouse.

Question 3

SBS Ltd is a medium-sized bus operator. It provides bus services to different parts of Malaysia, passing through many major towns. In order to serve its customers better, SBS provides them with online **bus ticket booking** facility.

Briefly describe **FOUR (4)** functions (Input, Process, Output, Storage) of the bus ticket booking system used by SBS Ltd.

- **Input function**
  - Customer details
  - Booking details
  - Schedule details
  - Bus details (seat, price)
- **Process function**
  - Seat availability checking
  - Schedule checking
  - Price checking
  - Payment calculating
  - Seat file updating
  - Ticket booking file updating
- **Output function**
  - Bus ticket
  - Receipt
- **Storage Function**
  - Bus files
  - Ticket booking files
  - Schedule files
  - Price files
  - Seat files
  - Payment files

Tutorial 3: System Planning

Question 1

The Computer Science Society (CSS) holds examinations for its members all over the world. The examination is held every six months for some 300,000 students in 500 centres in 80 different countries.

Current System

Currently, all answer booklets collected from the different centres around the world are sent by courier service to the head office located in New York. In New York the booklets will be selected and sent (by courier service) to different markets. As soon as the booklets are marked, they will be returned to the head office in New York. The booklets will be checked before being entered into a computer system.

Proposed System

Because of the high cost of operation of the present system and the long time taken to announce the results, the management of the CCS is planning to implement an Online Marking System (OMS). In this new system, the answer booklets are scanned in New York. The markers will be then given access to the digital documents and the OMS for online marking.

(a) Briefly explain what is meant by **technical** feasibility.

- Specifying the hardware, software and personnel performance requirements of the system under study.
- Evaluating the requirements whether the requirements above are technically achievable. Any proposed solution must be capable of being implemented using existing hardware, software and personnel in the organisation.

(b) Describe **TWO (2)** technical **issues** that are likely to be considered in the OMS feasibility study.

- **Output**
  - Need to produce certain outputs, such as examination results, by a certain deadline date.
  - For example, to produce 120,000 examination certificates in two weeks.
- **Data inputs**
  - The need to enter accurately a large number of inputs, such as examination marks on scripts, in a limited timescale.
  - For example, entering results for 300,000 students in four weeks.

(c) List **THREE (3) costs** and **THREE (3) benefits** that you would expect to see in the assessment of the economic feasibility of the OMS. Actual values are not required, just broad headings.

- **Costs**
  - Hardware costs
  - Software costs
  - Cost of scannings
  - Training costs
  - Increased data communication costs
- **Benefits (both tangible and intangible)**
  - Reduced courier costs
  - Faster processing of scripts (no checking and less time spent with the courier)
  - Reduced checking costs
  - Improved moderation
  - Enhanced image of the organisation

Question 2

The E-Asia University is a learning university set up for adult learners. With its E-Asia E-Learning System (EAELS), students can get access to online teaching materials and other services such as forums, discussion rooms, and instant messaging. EAELS also allows lecturers to trace students' learning progress, record student attendance and coursework marks.

You are the system analyst of E-Asia University. The director of the university, Prof .Ong has approached you to add a new feature to the system. The new feature will allow students to take online examinations at different test centres around the world. A personal computer will be assigned to each student and each room will be monitored by closed-circuit television (CCTV) during the examination. Students' examination answers are saved in softcopy and will be assessed by the system. At the end, the system will generate results for each student and send them to their email accounts respectively.

(a) Identify and describe **TWO (2)** types of feasibility studies you need to consider for the case above.

- Evaluating the requirements of a system whether they are technically achievable in terms of input, output, hardware, software, and procedure.
- Examples: -
  - Number of concurrent users of the server can support during examination.
  - The ability of the system to process and generate students' results by certain deadline.
  - Security of computer system of test centre must be setup to protect the system against unauthorised access.

(b) Support your answers with **TWO (2)** suitable examples for each type of feasibility studies.

- **Social and operational feasibility**
  - Assessing whether the project could fit into the existing social and operational structure of the organisation.
  - Identifying any additional costs that may be incurred, such as re-training, redundancies.
  - Example: -
    - The challenges of lecturers to prepare exam questions using the online system.
    - Training might be required for lecturers and students to ensure that they are able to use the system correctly.
- **Economic feasibility**
  - Identify the costs and benefits of implementing the system and defining when those benefits will be realised.

- Example: -
    - Study on the selection of the most suitable technique for the investment like ROI, payback, PV, and etc.
    - Assess the costs of purchasing computer hardware and monitoring equipment like CCTV.
    - Assess the costs of training for lecturers and students.
    - Determine and select the technical options under consideration that company should choose.

Question 3

Star travel agency is one of the most popular travel agencies located in Johor Bahru. The travel agency provides travel and tourism related services to the public such as advice on destinations, plan trip itineraries and make travel arrangements for customers. Recently, some of the long term customers requested for an online booking system to be introduced.

As the business owner, Mr. Lee is considering to develop an online booking system which will support the travel agency's operation and future growth. The proposed online booking system is expected to receive customers' booking and produce reports for Mr. Lee on weekly basis. Mr. Ong, an information system analyst is assigned to design the proposed online booking system.

Required:

a) Based on the above case study, identify and explain **TWO (2)** sources of system request.

- **Sources of System Request**
    - **Top Management Directive**
        - The business owner, Mr. Lee wishes to convert his current traditional business to online booking system which will support travel agency's operation and future growth.
    - **End User Request**
        - Long term customers of Mr. Lee are requesting for an online booking system which enables them to book tickets in the travel agency conveniently.
    - **External Sources**
        - External source of the system request may include competition ass posed by the other travel agents who are offering many online services like online quotations, customised tour packages, payment and booking to their customers.

b) Discuss **TWO (2)** expected improvements after implementing the new system.

- **Expected Improvements**
    - **Better service**
        - The new system is expected to allow customers to place bookings online conveniently and check their booking status after new system is implemented.

- **Clearer information**
  - The new system is expected to produce weekly report for Mr. Lee which will be able to help Mr. Lee to make better decisions for his business.

c) List **THREE (3)** intangible benefits of the proposed system.

- **Intangible Benefits**
  - Improves customers' satisfaction
  - Improves customer image
  - Increases customer retention
  - Provides convenience to customers where they can do bookings online directly.

d) Define the term *social feasibility* study and discuss **ONE (1)** possible social feasibility issue for the above case study.

- **End user motivation and resistance**
  - The customer may feel happy and welcome to the new online booking system which will bring more convenience to them.
  - However, those employees who do not have computing skills may feel worry and refuse to use it.
- **Skills in using the system**
  - The employees may need to be trained on how to use the new online booking system.

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BAIT1043 Systems Analysis and Design

Suggested Answers

Tutorial 4

System Analysis 1 – Fact Gathering

Question 1

A major project is currently about to enter the Requirements Analysis stage where managers, operators and customers will be asked about their requirements for the new system. The project team is currently reviewing the fact gathering techniques available for identifying, prioritising and agreeing to these requirements.

(a) Briefly describe **THREE (3)** advantages of interviewing users, particularly at their workplace, to determine their requirements.

- **Overcome Resistance**. Provides an opportunity to meet and overcome user resistance. It gets cooperation of people involved and giving them the feeling of having made a substantial contribution towards the design of new procedure.
- **Clarify Facts**. Face-to-face interview allows the interviewer to react to anything the interviewee says. If surprising or confusing statements are made, the interviewer is free to pursue the topic with additional questions immediately in order to verify and clarify the confusing facts. You can also observe the respondent's voice inflection and body motions, which may tell you more than words alone.
- **Build Rapport**. The interview provides the analyst with the opportunity to build rapport with the user. The analyst will often require the cooperation, support and enthusiasm of the user throughout the whole project. The face-to-face interview is an excellent opportunity to develop the rapport that will be the necessary foundation of a good working relationship.
- **Intimate and Frankness**. People who would be unwilling to put critical or controversial comments in writing talk more freely in person. You can probe with open-ended questions that people would normally balk at answering on paper.

(b) Briefly describe **THREE (3)** circumstances where questionnaires are an appropriate method of investigating users' requirements.

- **When there is a Large number of respondents**. Questionnaires technique is suitable to be used in a situation where there is a large number of respondents to collect information from eg more than 2,000 respondents. There may be insufficient time to interview all the possible users of the system.
- **Geographically distributed users**. It is time-consuming and expensive to interview users who are widely geographically distributed. The cost of collecting their views and requirements probably outweighs the insights they will give. In such circumstances it may be appropriate to interview a small number of users and then send a carefully constructed questionnaire to the rest.

- **Sensitive Issues**. In some circumstances the analyst may wish to collect information whose accuracy would be enhanced if the provider of the information remains anonymous. For example, information on the effectiveness of management, or the efficiency and service of an internal IS department. Questionnaires provide a confidential way of gathering
- **Takes Time**. Where factual information requires the respondents to investigate, father and compile data rather than respond with instant answers as in interviews. In this kind of situation the respondents will be given sufficient time to carry their tasks.

(c) An analyst is planning an interview with a user about his requirements for a new system. He has **identified the participants** in the interview. Briefly describe **THREE (3) other aspects** that should be included in the interview plan.

- **Make appointment** – After having done the above, the interviewers must make an appointment with the interviewees and discuss items such as: time, location (venue), dates, agenda (objectives), duration of the interview session.
- **Carrying out background research** – A research must be carried out about the interviewee background, for example: job they perform, roles, responsibilities, authority, position. These will allow the interviewers to prepare some relevant questions.
- **Prepare some relevant questions** – The interviewers must prepare interview questions related to the issues or problems raised (in System Request form). The suggestions to solve the problems, the main objectives of the system, services or improvements requested can also be used for preparation of the interview questions.

Question 2

A software system is to be developed to automate various operations of a library in an institute of higher learning. This system will cover various functions including, borrowing, returns, fines, reservations, renewing, browsing, searching and querying facilities. It will be used by the library staff, book borrowers and readers.

For the facilities mentioned above, identify and describe **TWO (2)** most important **non-functional** requirements.

1. Interfaces with other systems

Very few software solutions are self-contained. There is an increasing need for applications to receive data from one system and to supply it to another. A library system may have to import information about new students and students leaving the college from a Registration system and export budget requirements to an accounts system for cash flow forecasting. Some of these interfaces may also be with generalised software packages, such as spreadsheets or specialised tools for data mining.

2. Audit requirements

Most software solutions require some sort of audit trail. This trail records significant information about particular transactions. For example, in a library system, the writing-off of old books by a librarian might be recorded on an audit trail. This is a significant transaction and may be the target of fraudulent use. For example, a library might issue purchase order to buy own books. An audit trail for this function might include the date and time of change or transaction, the previous book details, the new book details, the employee-ID of the user making the change and the workstation-reference.

3. Archiving, backup and recovery

The backup module is designed to allow the users (librarians) to carry out regular backups of both the transaction (eg borrowing, reservation, returns) and master data (eg book file, member file) in a library system. Auto-back up can be programmed and scheduled to allow the system to backup the data automatically to some remote locations (eg. Branches, on the Cloud). When the data are lost due to eg fire, flood or earthquake the data can be recovered through the Recovery Module.

Question 3

"Interviews and questionnaires are two of the popular fact finding techniques used to understand users' requirements during the analysis phase." Discuss **TWO (2)** major differences between these two techniques.

Interviews

- Background information (eg. interviewees' name, responsibility) are gathered and some basic questions are prepared (to be used during interviews).
- It involves a formal face-to-face meetings between the analyst and the user where prior appointment must be made. The meeting is formally documented and its contents **confirmed** with the user at the end of the interview.
- During the interview session, both the interviewers and interviewees can seek clarification of both the questions or answers given.

Questionnaires

- Questionnaires must be carefully prepared, verified and tested before sending them to the respondents.
- There is no formal face-to-face meeting required. The questionnaires are simply sent to the respondents and a timeframe is given to them to return the questionnaires.
- It is not possible for the respondents to seek clarification about the questionnaires if they don't understanding their requirements.

Differences	**Interviews**	**Questionnaires**
1. Technique.	**Face-to-face** technique. Involves interviewer and interviewees	**Non Face-to-face** technique. Involves the analysts and respondents.
2. Before	Preparation eg questions and appointment.	Preparing formatted questionnaires. Such questionnaires are commonly verified first.
3. During	During interview session questions are asked and answers given are recorded.	Send the questionnaires to the respondents allow them time and deadline to answer and reply.
4. After	The analyst will further analysed the answers given and compiled into users' requirements and requesting users to confirm.	Not all questionnaires will be replied. The questionnaires received will be compiled and analysed before becoming users' requirements.

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Tutorial 5

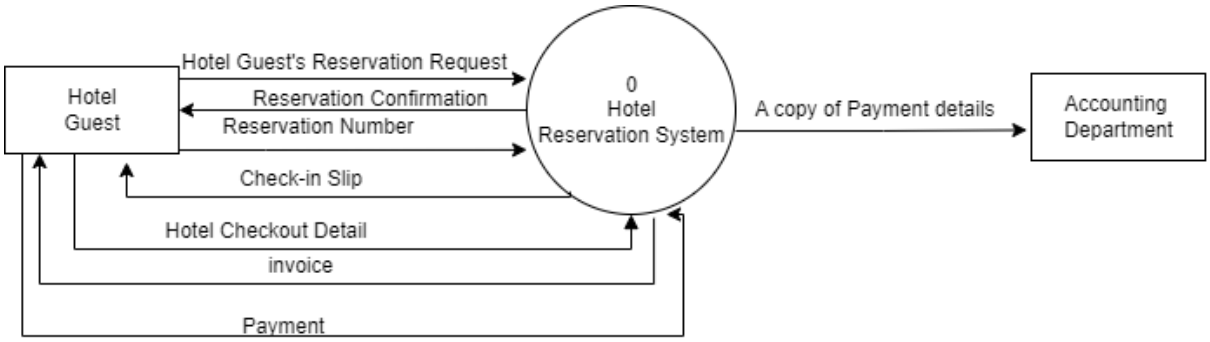
System Analysis 2 – Fact Recording 1

Question 1

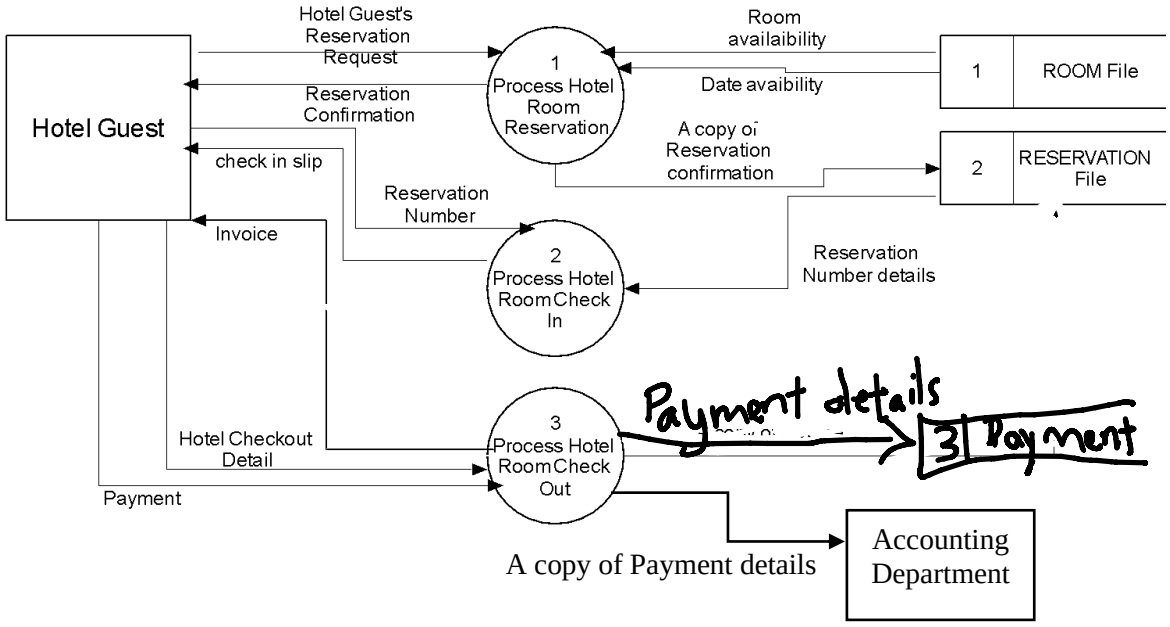
The following is the narrative description of an information system in a Budget Hotel:

"When a reservation-request is received from a guest, the availability of the room and dates requested are checked from ROOM file. If the room is available, a reservation-confirmation is sent to the guest. A copy of the reservation confirmation will be stored into RESERVATION file. On check in day, the guest is required to provide his/her reservation number. This number is entered into the system for verification, and a check in slip is printed and given to the guest together with the room keys. Finally, on check out day, the guest needs to provide check out detail to generate the invoice. Payment is received from the guest and will be stored in the PAYMENT file. A copy of payment details is sent to the Accounting Department."

(a) Draw a **Context Diagram** of the above.



(b) Construct a **diagram** 0 data flow diagram for the above scenario.



Question 2

The following describes the business process of an estate agent.

When potential buyers phone in for information about properties available, a Property Interest card will be completed. The potential buyer's details (eg. name, address) will be recorded. At the same time, a mailing list will be created and stored for future use, example sending out monthly magazine and news on properties.

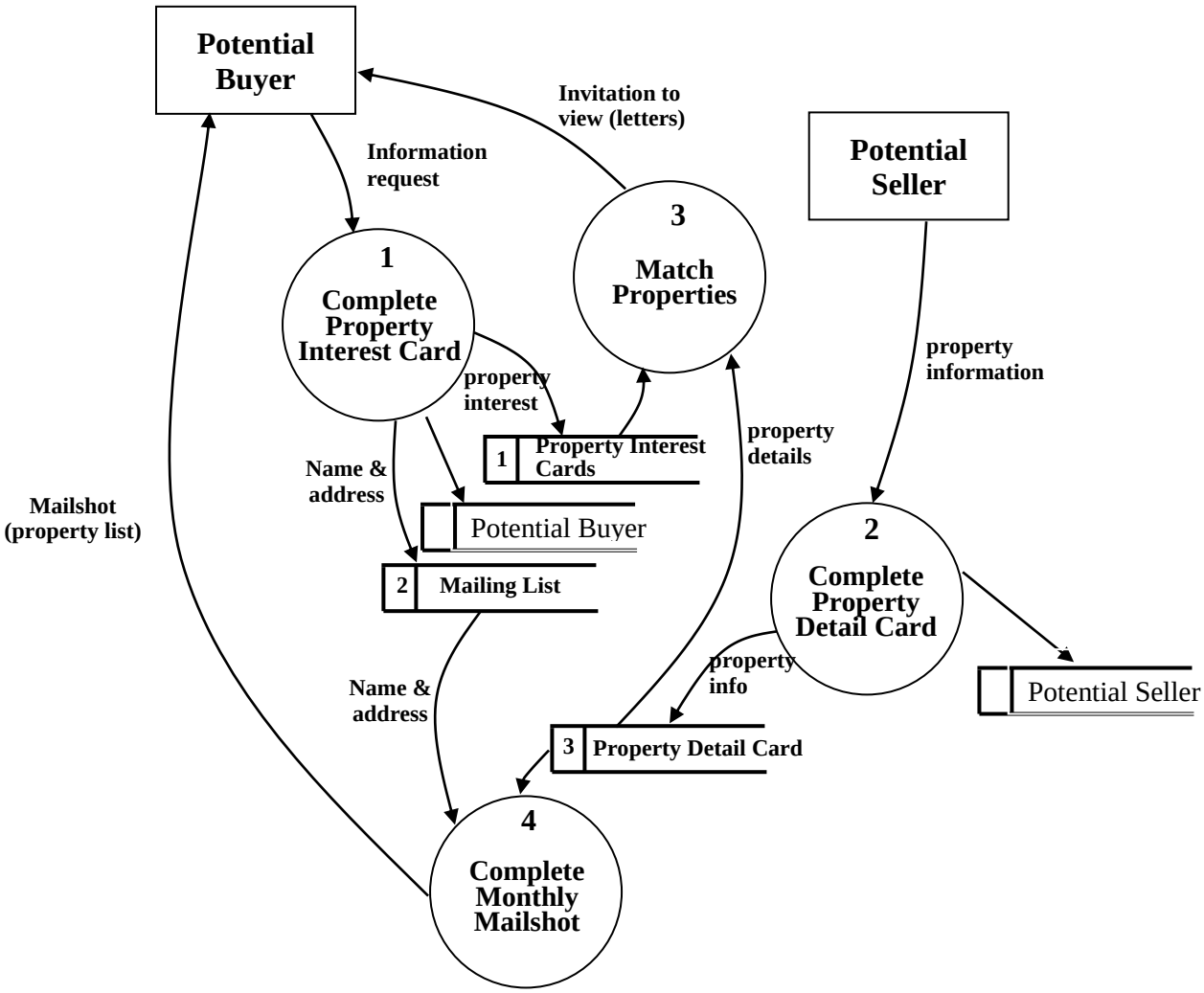
Potential sellers of properties will also have their details recorded onto a Property Details card. This gives the name and address of the seller and the details of the property or/and they wish to sell.

On a weekly basis, the buyers' interests and the sellers' interest will be matched. This can be carried out by matching the Property Interest cards details with the details on the Property Details cards. When there is a good match, letters will be sent to the potential buyers with details of the relevant properties.

In order to generate interest, on a monthly basis (last day of a month), a list of properties (from the Property Details cards) will be created and posted to potential buyers on the mailing list.

Required:

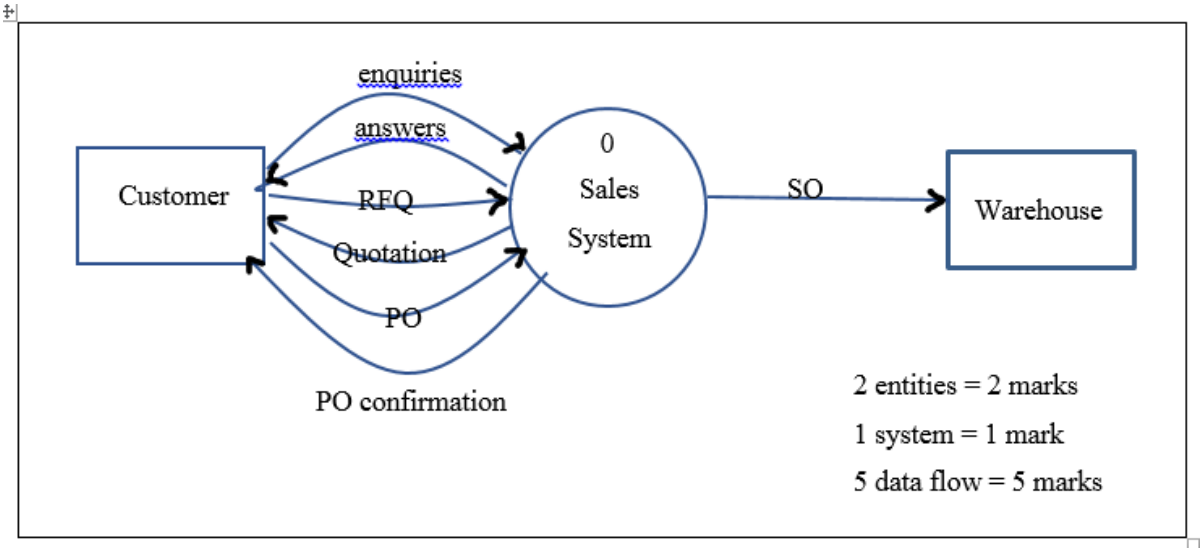
Based on the above scenario, draw a **Diagram 0 DFD** of the current business process.



Question 3

The Sales System will support transactions with customers. For shipping of goods to customers, the Sales System will interact with the warehouse.

Draw a Context Diagram for the **Sales** System. (**Note**: ensure the Context Diagram shows only 1 system, 5 relevant data flows and 2 entities).



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BAIT1043 Systems Analysis and Design

Suggested Answers

Tutorial 6

System Analysis 2 – Fact Recording 2

Question 1

The following are interview notes recorded by an analyst during an interview session related to an order processing system.

Interview Notes

A customer may place many orders but must have placed at least one order. Each order will come from only one customer.

A particular product may be listed on different orders. An order will usually contain many products.

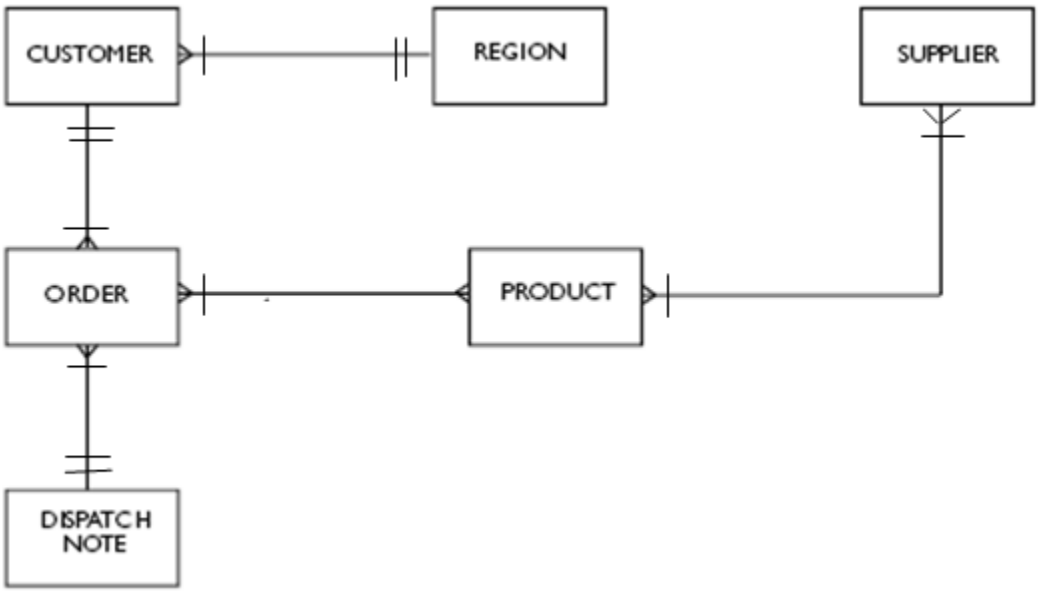
Each product can be purchased from a number of suppliers. Some suppliers supply more than one product. A supplier must supply at least one product.

An order is always dispatched in a single delivery. However, sometimes more than one order is listed on the same despatch note.

Each customer is allocated to a sales region. A sales region may have more than one customer in it. A sales region must have at least one customer in it.

Required:

Based on the interview notes given, draw an Entity Relationship Diagram (ERD).



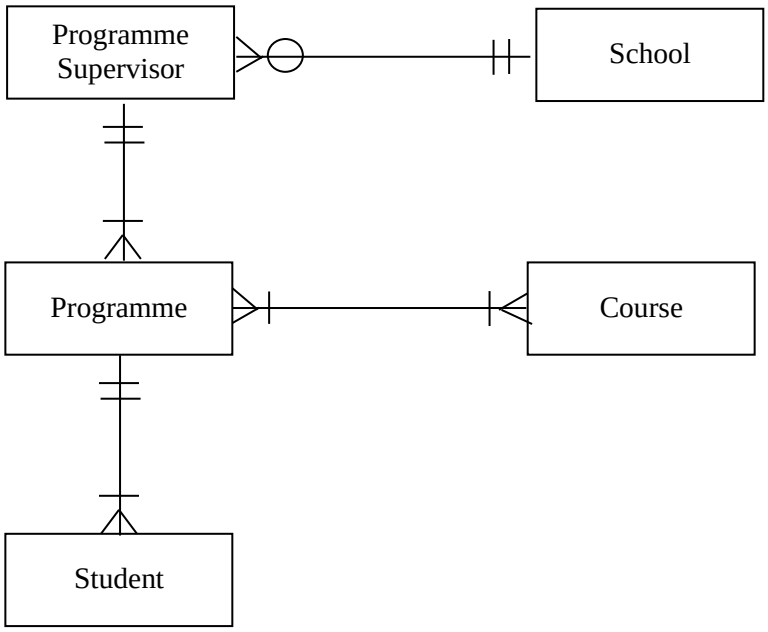
Question 2

The following information was recorded in an interview.

1. At a college, each student is identified by a unique student number.
2. Each student must register on only one programme. A programme has a minimum of one student.
3. Each programme contains a number of courses.
4. Each programme must be managed by a programme supervisor. A programme supervisor may manage many programmes but must manage at least one.
5. Each programme supervisor must be allocated to a school. Some schools employ many programme supervisors, while others do not employ any at all.

Required:

(a) Using a standard notation (introduced during lecture), draw an Entity-Relationship Diagram (ERD) for the above information. (**Note** : the notes recorded appear to be not complete, therefore you have to make some logical and acceptable assumptions).



(b) List **FOUR (4)** relevant *data attributes* (data fields) for the **Student** entity (data table or data file). DBDL format not needed.

Attributes

Student : student number, student name, telephone, address, email

Question 3

The following information has been recorded in an interview.

Each customer owns zero or one shopping cart instances; each shopping cart instance is owned by one and only one customer.

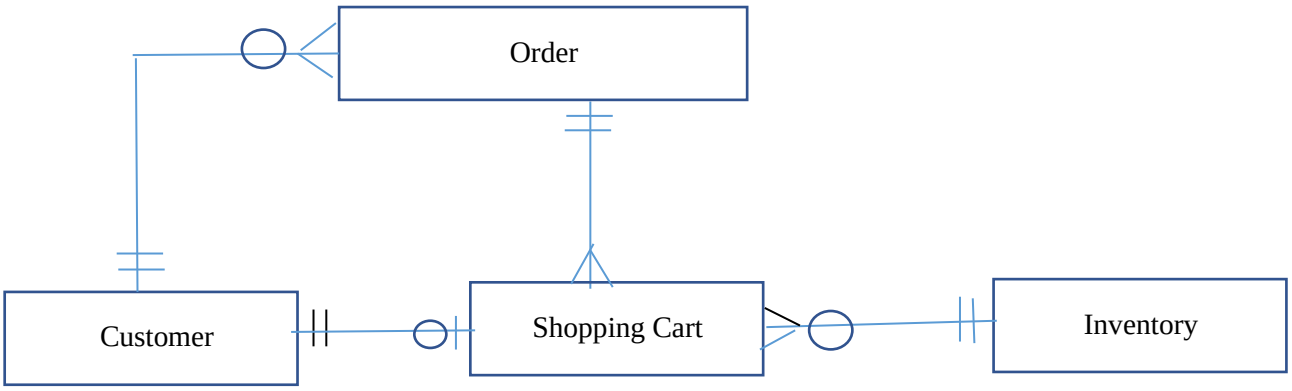
Each shopping cart instance contains one and only one inventory item; each inventory item is contained in zero or many shopping carts instances.

Each customer places zero to many orders; each order is placed by one and only one customer.

Each order contains one to many shopping carts instances; each shopping cart instance is contained in one and only one order.

Required

Construct an Entity Relationship Diagram (ERD) for the above scenario.



Tutorial 7: System and Interface Design

Question 1

For a better presentation, a **functional decomposition diagram** is normally drawn for a particular system to show its functions (or modules). Instead of drawing a functional decomposition diagram, for each of the following systems, you are requested to list **FOUR (4)** major functions. (**Note**: you need to use relevant and useful module name for each of the major function you have identified. DO NOT describe the functions, but merely provide the module names).

1) **Inventory System**
   - Receive goods
   - Distribute goods
   - Transfer goods
   - Goods returns
   - Reporting
   - File maintenance

2) **Library System**
   - Borrow books
   - Return books
   - Renew books
   - Reserve books
   - Memberships
   - Reporting
   - File maintenance

3) **Hotel System**
   - Room Reservation
   - Cancellations
   - Check-in
   - Check-out
   - Billing / Invoicing
   - Enquiries
   - Reporting
   - File Maintenance

Question 2

An analyst has already completed analysis of the users' requirements. He is now in the system design stage. The system involved is an **inventory system** for a manufacturing firm. The analyst has been assigned the responsibility of designing suitable reports that could be useful for staff at all levels of the organisation. The users may also include those from other departments where their systems are linked and interfaced with the inventory system.

Required:

Identify **THREE (3)** reports (with titles) which in your opinion will be useful to the users. For each report listed, briefly describe the report **titles**, what the report would **contain** and to **whom** it would be useful and for what **purpose**.

No.	Report Titles	Report Content	For Whom	Purpose
1.	Stock balance for certain items as at 31st March 2023	Shows the current stock balances for specified item in the warehouse	Sales manager	To make decision on whether to accept the orders from customers. For example, checking availability of the items requested.
			Account manager	To compute Profit & Loss (P&L) statements and balance sheets
			Purchasing manager	To make decision on how much to buy and when to buy the items request
2.	ABC Analysis for all items as 31st March 2023	Shows the items categorised into different categories such as A, B, C based on the values of the items. For example, sorting the stock items according to their costs from the highest to the lowest.	Warehouse manager	To make decision to decide on the control of the items which are more expensive especially better locking system. More expensive items will have more frequent stock count.
3	Stock ageing	Shows the time duration of items staying in the warehouse. Shows the stock movements lifespan in the warehouse.	Sales manager	To allow the sales manager to make decision to dispose the items which are ageing through warehouse sales.

Question 3

Determine the type of data validation check based on the examples given below.

(i) Check that the daily hours worked by an employee, for example, must fall within the range of 0 to 24.

Range check

(ii) Check that a numeric field must have only numbers or numeric symbols, and an alphabetic field can contain only the characters A through Z or a through z.

Data type check

(iii) Check that the customer details are entered in the required fields. Otherwise, the record won't be able to save.

Null value check

(iv) To be eligible of a banking loan, the loan applicant must be between 21 to 55 years old.

Range check

(v) Check that the Date of Birth (DOB) entered is in a particular pattern.

Format check

(vi) Check that the order input fulfil a minimum purchased quantity by a customer before a discount will be given.

Lower limit check

Question 4

Many systems have designs that require users to enter data manually. In doing so, users frequently make a lot of mistakes and also take time to complete their job.

With regard to system design, suggest **THREE (3)** design areas which a system designer can include in order to reduce the amount of data input manually and hence time taken, and also able to reduce mistakes.

- **Design areas**
  - **Pull-down lists**
    - Users can select and click from the list
    - instead of keying in text manually.
  - **Default entry**
    - Certain data will be filled in automatically by the system
    - instead of requiring users to key in system date and tax manually.
  - **Checkboxes and radio buttons**
    - Users need only to select and click in the checkboxes or radio buttons (eg. Male / Female)
    - instead of having to key in manually.
  - **Validation checks**
    - It validates data to ensure data are entered correctly.
    - This reduces the need to re-key again the correct data when the initial data has keyed in wrongly.

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Suggested Answers

Tutorial 8

Database Design

Question 1

A system designer is now planning to design the primary key (code) for the Customer Membership entity.

(a) Briefly explain **TWO (2)** characteristics of a good code design.

1. **Uniqueness**. The code has only one value for a record in the entity. No other records have the same value.
2. **Conciseness**. The code should be as short as possible and still able to represent a record uniquely.
3. **Stability**. Codes which do not require to be frequently changed/updated when record characteristics change.
4. **Expandability**. The code should be long enough to allow for possible future growth eg. add serial numbers, year, alphabets to the code.

(b) Describe the following types of codes and give **ONE (1)** example for each:

(i) Sequence code
(ii) Block sequence code

i **Sequence code**

- These are numbers or letters assigned in a specific order. Sequence codes contain no additional information other than an indication of order of entry into the system.
- Example: A HRIS issues consecutive employee numbers to identify employees eg 2056 means number 2056th employee.

ii **Block sequence code**

- These codes use blocks of numbers for different classifications.
- Example: College course number. 100-level courses eg. Chemistry 110 and Mathematics 125, are Year 1 courses, whereas 200s indicate Year 2 courses.

(c) Suggest **ONE (1)** type of code design which is appropriate for a *customer membership number*. Justify your answers.

Students' answers may vary.

Suggestion: Sequence code.

Justification: (1) The consecutive numbers allocated are **easy and simple** to design and execute, and (2) the sequence code used is **unique** and able to identify some **details** about the customers. For example, 2056 means number 2056th customer.

Question 2

Consider the following relations (tables) for part of an AIRLINE system database but intentionally presented not in perfect DBDL format yet.

FLIGHT (Flight No, Date, Departure Time, Dest Code)

SCHEDULE (Plane Id, Flight No)

DESTINATION (Dest Code, Destination)

PLANE (Plane Id, Plane type, Capacity)

(**Note** : SCHEDULE is an *Associative Entity*)

Required:

(a) Identify all the **primary keys** and **foreign keys** in the relations above, and make corrections, where relevant to ensure the presentations are in **DBDL** (Database Design Language) format.

Primary Keys (*those in bold and underlined*) and Foreign Keys (*those with* *)

FLIGHT (**Flight_No**, Date, Departure Time, Dest_Code)

SCHEDULE (**Plane_Id*, Flight_No***)

DESTINATION (**Dest Code**, Destination)

PLANE (**Plane_Id**, Plane type, Capacity)

(b) Explain what **primary key** and **foreign key** are.

Primary Key

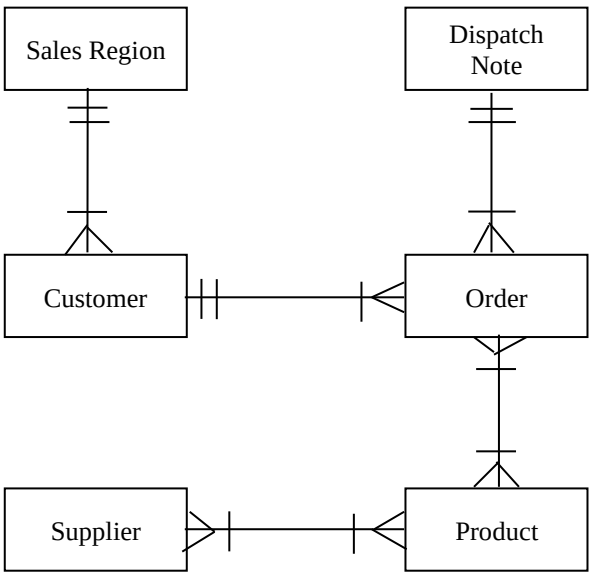
- A field or a combination of fields
- Unique - A primary key must be unique.
- Purpose - It uniquely identifies a particular record from another.
- Example – Plane Entity : Plane Id, Flight : Fight Id

Foreign Key

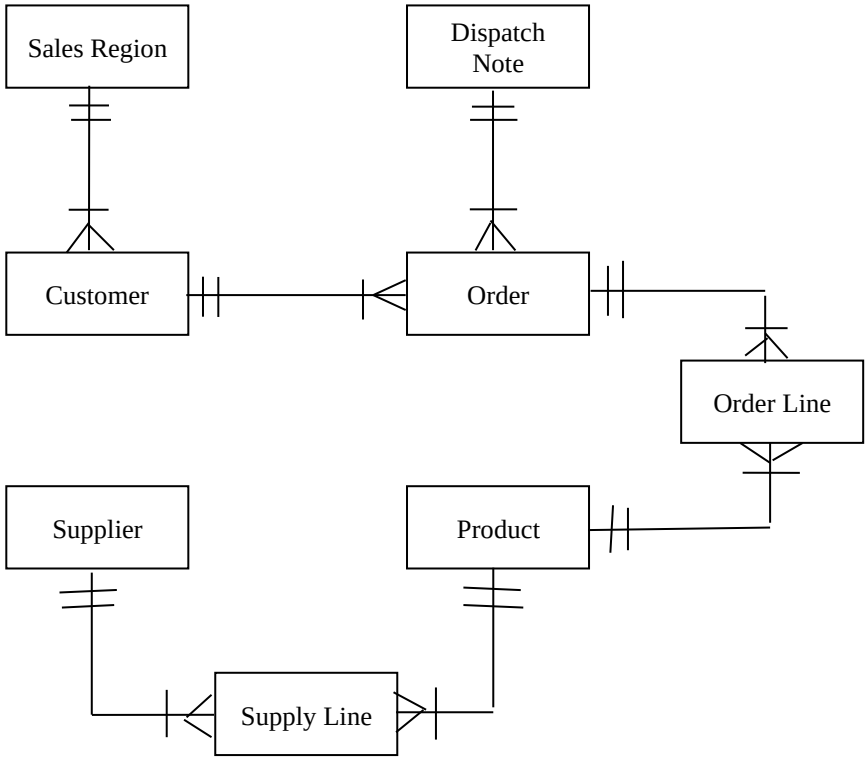
- A field in one table
- Borrowed – a primary key which is borrowed from another table (entity)
- Purpose – to establish the relationship between the two tables.
- Example – Dest Code, Flight Id

Question 3

The entity-relationship diagram (ERD) shown below has been drawn for an order processing system. The diagram is based on the some interview notes recorded. (**Note** : Assumption is made that the following has been correctly drawn based on the interview notes and based on the company's current business rules, practices and policies eg between Dispatch Note and Order).



(a) Resolve any many-to-many relationships between the entities in the above ERD.



(b) By using a **DBDL** (Database Design Language) format, identify the major data attributes of each entity above. Show clearly both the primary and foreign keys (if any).

Example of a DBDL format : PAYMENT (Payment No., Date, Invoice No.*).

Data Attributes

SALES REGION (Sales Region Code, Region Name)

CUSTOMER (Customer ID, Customer Name, Address, Sales Region Code*)

ORDER (Order Number, Order Date, Customer ID*, Dispatch Note Number*)

ORDER LINE (Order Number*, Product Code*, Qty)

DISPATCH NOTE (Dispatch Note Number, Date)

PRODUCT (Product Code, Product name, Description, Unit of Measurement)

SUPPLY LINE (Product Code*, Supplier No.*)

SUPPLIER (Supplier No, Name, Address, Telephone number)

Question 4

Western Wear is a mail-order firm that offers an extensive selection of casual and recreational clothing for men and women. Western Wear launched a new Web site, and the company decided to develop a new set of product codes. Currently, 650 different products exist, with the possibility of adding more in the future. Many products (**items**) come in various **sizes**, **styles**, and **colours**. The marketing manager asked you to develop an individualised product code that can identify a specific item and its characteristics. Your initial reaction is that it can be done, but the code might be fairly complex. Back in your office, you review the text material on codes and give the matter some thought.

(a) Design a code scheme that will meet the marketing manager's stated requirements (a master file).

Item (allocate 4 characters)

Shirt = SHRT

Pant = PANT

Skirt = SKRT

T-shirt = TSHT

Socks = SOCK

Size (allocate 2 characters)

Extra small = ES

Small = SM

Medium = ME

Large = LG

Extra Large = EL

Extra extra Large = TL

Style (allocate 2 characters)

Korean = KO

Asian = AS

American = AM

Chinese = CH

Japanese = JP

Colours (allocate 3 characters)

Black = BLK

Red = RED

Blue = BLD

Green = GRN

Yellow = YLW

White = WTE

Serial Number (allocate 2 digits)

00 – 99

Example : SHRTLGKORED00

(b) Suggest a code scheme that will identify an order (a transaction file)

Unless there is some other reason, the order entry system automatically assigns order numbers sequentially and a sequence code should be used eg. 000000000001. Need to allocate sufficient number of digits to ensure the code design would be able to cover the increase in the number of order transactions.

TAR UMT

BAIT1043 Systems Analysis and Design

Suggested Answers

Tutorial 9

Procedural Design

Question 1

After an interview, an analyst recorded the insurance premium calculation processes in Structured English as follows :

DO Calculation of Vehicle Insurance premium

Enter make and model of vehicle

Retrieve insurance premium for this make and model of vehicle

Display this insurance premium on the screen

Enter age of applicant

IF age<25 AND age>60

Add 10% to basic insurance premium

ENDDO

Display applicant insurance premium on the screen

ENDDO

Note : The Structured English should have the following **standard** constructs

Sequence: DO……ENDDO

Selection: IF……..ENDIF

Required:

The Structured English produced by the analyst has one *functional error* and one *standard error*. Identify each error and explain how you would correct it.

Functional Error

IF age < 25 AND age > 60

An applicant cannot be under 25 and over 60.

Correction of Function Error

IF age < 25 OR age > 60

Standard Error

```
IF age < 25 AND age > 60
    Add 10% to basic insurance premium
ENDDO
```

The IF should be terminated by an ENDIF not an ENDDO

Correction of Standards Error

```
IF age < 25 OR age > 60
    Add 10% to basic insurance premium
ENDIF
```

Question 2

In a sales promotion policy, preferred customers who order more than RM1,000 are entitled to a 5% discount, and an additional 5% discount if they use a charge card. Preferred customers who do not order more than $1,000 receive a RM25 bonus coupon. All other customers receive a RM5 bonus coupon.

Draw a **decision table** based on the above description.

	1	2	3	4	5	6	7	8
Preferred customer	Y	Y	Y	Y	N	N	N	N
Ordered more than RM1,000	Y	Y	N	N	Y	Y	N	N
Used our charge card	Y	N	Y	N	Y	N	Y	N
5% discount	X	X						
Additional 5%discount	X							
$25 bonus coupon			X	X				
$5 bonus coupon					X	X	X	X

Question 3

Hudley Ltd offers customers a loyalty scheme that rewards them with discounts and bonus points for every transaction they make. In this scheme, all customers who pay in advance receive a 5% discount on the product price.

If these customers are also designated key account customers, then they also receive 50 bonus points. A key account customer, who does not pay in advance, receives only 20 bonus points. If a customer (whether non-key or key account) has ordered more than RM1,200 worth of goods in the year, then their customer card fee (of RM10) is returned at the end of the year. In all other circumstances there are no discounts, bonus points or card fee refunds.

(a) Draw a DECISION TABLE for the customer loyalty scheme at Hudley Ltd.

	1	2	3	4	5	6	7	8
Customer paid in advance ?	Y	Y	Y	Y	N	N	N	N
Key account customer ?	Y	Y	N	N	Y	Y	N	N
Order > RM1,200 ?	Y	N	Y	N	Y	N	Y	N
5 % discount	X	X	X	X				
Receive 50 bonus points	X	X						
Receive 20 bonus points					X	X		
Card fee returned	X		X		X		X	
No discounts, bonus points or refunds								X

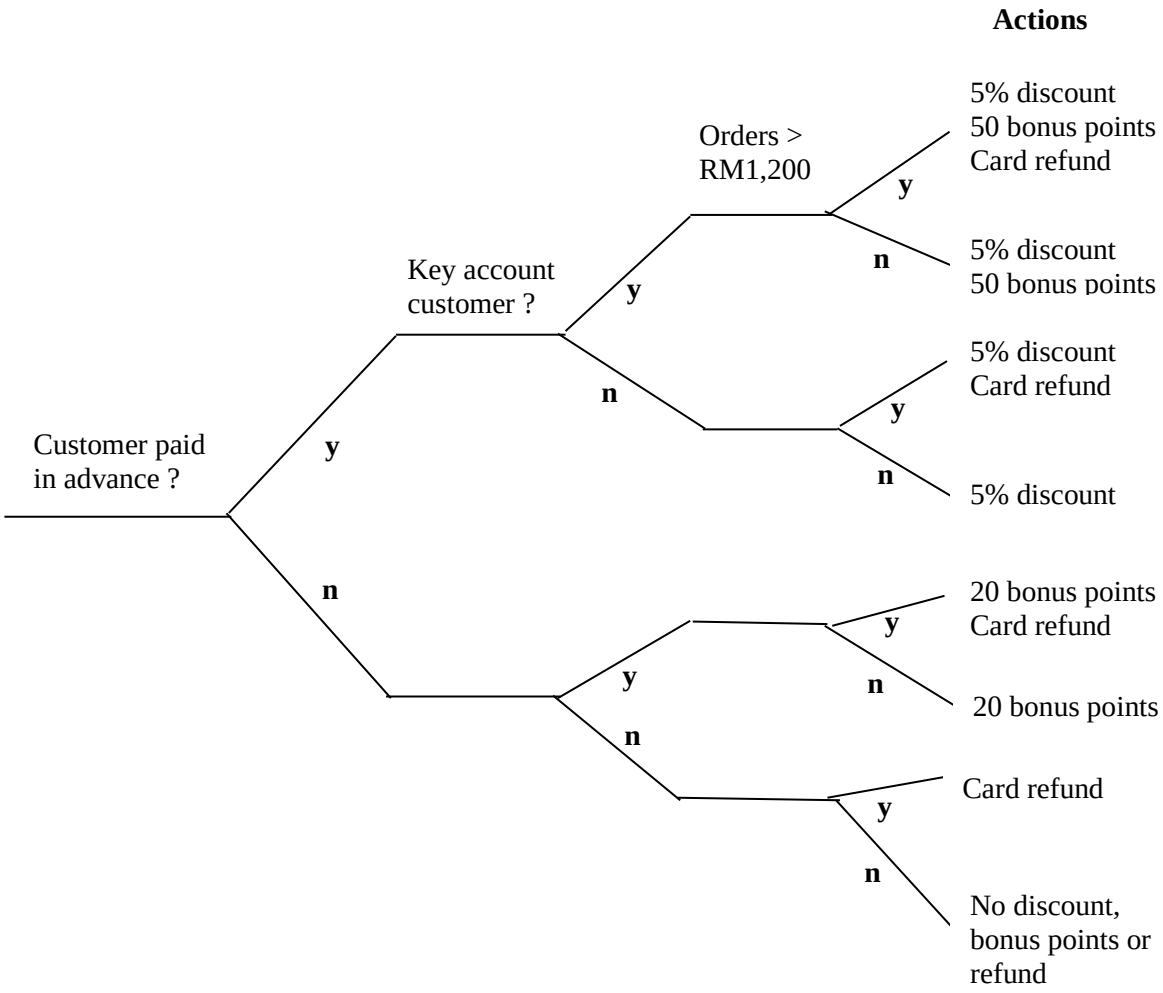
(b) A DECISION TREE could also be drawn for the loyalty scheme. Briefly describe what a decision tree is and describe **ONE (1)** advantage of the decision tree, compared with the decision table.

Description of Decision Tree

- A Decision Tree is a **design** tool.
- A Decision Tree provides a **graphical** representation of the conditions and actions.
- The representation by the Decision Tree is in the form of a tree **structure** (a fallen tree).

Advantage - A decision tree provides a graphical representation of the decisions which makes it easy to understand.

(c) Draw a DECISION TREE for the above case.



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BAIT1043 Systems Analysis and Design

Suggested Answers

Tutorial 10

System Development 1 – Programming and Tools

Question1

Alpha Computer Services is interested in developing systems that are of good design.

(a) Explain why **maximising cohesion** and **minimsing coupling** leads to more maintainable systems.

High Cohesion

Measurement – Cohesion measures the **functional relationship** of the instructions exists within a module in a system.

Meaning – a module is said to be cohesive if all the instructions in the module jointly accomplish a single task or a small set of related tasks. High cohesion means that the instructions within a module are closely related to each other, such that they can work to accomplish specific objectives of the modules more efficiently and easily.

Advantages - A cohesive module is well structured, and therefore easy to code, debug and maintain.

Low Coupling

Measurement – Coupling measures the degree of **dependence** between modules in the system.

Meaning – High coupling means that the modules are highly / tightly connected, thus the modules are dependent on each other. On the other hand, low coupling means that the modules are independent from each other. Two modules are said to be highly coupled if each depends on the other for its proper functioning.

Advantages – Easier to maintain since a bug in one module would not infect another module. If one module is modified, the other may not need to be modified.

(b) Explain **THREE (3)** reasons why a good design is an important process in the system development life cycle.

1. **Quality**. Design is the place where quality is fostered in software development. Design provides us with representations of software that can be assessed for quality.
2. **User requirements**. Design is the only way that we can accurately translate a customer's requirements into a finished software product or system.

3. **Maintenance**. Software design serves as the foundation for all software engineering and software maintenance steps that follow. It provides information to system maintainers about the original intentions of the system designers.

4. **Communication**. It serves as a communication medium between the designers of sub-systems.

5. **Testing**. Without design, we risk building an unstable system - one that will fail when small changes are made; one that may be difficult to test; one whose quality cannot be assessed until late in the software engineering process, when time is short and many dollars have already been spent.

Question 2

During the Systems Development Life Cycle (SDLC), the systems analyst needs to model the user's requirements to help record, analyse and communicate understanding of the requirements.

(a) Briefly explain what a CASE tool is.

Definition of CASE Tool (should contain the following 3 points) :

- **Acronym**. CASE is an acronym for computer assisted (or aided) software (or systems) engineering.
- **Software Tools**. It is a piece of software that allows the analyst to develop and maintain the system (e.g. Data Flow Diagrams and Entity Life Histories) of the systems development life cycle on a computer more efficiently.
- **Purpose**. Therefore CASE tools are software tools which aim at automating development tasks by relying on computer. The long-term objective of CASE tools is to automate key aspects of the entire systems development process to help in improving analyst productivity and systems quality.

(b) Describe **THREE (3)** ways how a CASE tool could assist in the development and maintenance of the **models**, such as DFD and ERD.

- **Easy to draw models**. It will be easier to create each model and to produce a well balanced and professional looking diagram. Such a tool will include standard shapes boxes that can be selected and positioned on the screen and linked using simple commands. This produces a very professional looking diagram that can be re-organised to improve its clarity to the user.
- **Easy to store models**. CASE tools store defined models and allowing their subsequent retrieval and amendment. When changes are required, the stored diagram can be easily brought back onto the screen, edited and re-printed.
- **Easy to update models**. It is very difficult to update hand-drawn models. Models held in a CASE tool can easily be edited, updated and re-printed.
- **Enforcing standards**. The CASE tool may include simple checks to ensure that the standards and conventions defined for constructing the diagram are correctly adhered to. For example, a certain CASE tool does not allow a one-to-one relationship to be represented on the diagram and any attempt to do this will be prevented.
- **Automatic cross-referencing** between different models to promote a consistent view of the system under development. Example, checking the entities of the ERD and ELH defined for each entity. In most CASE tools the ELH is the 'child' model of the parent entity defined in the ERD.
- **A central Data Dictionary**. The Data Dictionary underlying the CASE tool will hold the data items within each entity. The format, value range, default values etc of each data

item can also be held within the Data Dictionary. This means that all the information held about the system is in one place and it is easy to maintain and update.

(c) Describe **THREE (3)** ways CASE tools may be used in software development.

- **Drawing Descriptive Diagrams**. Many CASE tools include diagramming tools which support the drawing of diagrams such as DFD, ERD and to store the details internally. When changes must be made, the nature of the change is described to the system, which can then redraw the entire diagram automatically. The ability to change and redraw eliminates an activity that analyst find both tedious and undesirable.
- **Producing and maintaining documentation**. The graphical editing facilities provided means that high quality documents can be produced eg. DFD, ERD. Furthermore changes to those documents can easily be made and re-printed.
- **Adhering to development standards**. Standards ensures that development of individual models will be carried out using standard rules of construction. For example, a data store cannot be directly linked to an external entity in a dataflow diagram.
- **Maintaining a data dictionary**. Stores information about the constituent parts of the logical systems specification. Eg. entries for dataflows, data stores, entities, processes, - external entities. All can be listed. Also supports the consistency checks and cross-referencing eg. the data stores of the DFD to the entities of ERD.
- **Prototyping**. CASE tools can support prototyping in two ways : developing screens and output prints. Contents can be displayed on a screen and to link these screens together. CASE tools convert the process descriptions of the logical data dictionary into programs and the data stores/entities into files and databases.
- **Generate Computer Codes**. Code generators automate the preparation of computer software. They incorporate methods that allow the conversion of systems specifications into source codes. CASE tools covert the process descriptions of the system into program codes and the data stores/entities into physical files and databases.

Tutorial 11: System Development 2 – Testing and Documentation

Question 1

Compare and contrast the following testing methods used by software developers. In your answers discuss: number of **modules** involved, **purposes**, **who** normally carry out the tests, and the **test data** used.

(i) Unit Test

(ii) Integration Test

(iii) User Acceptance Test

(iv) System Test

Areas	Unit Test	Integration Test	UAT	System Test
Number of modules	Testing of individual programs, separately and independently	Testing of two or more programs which are connected together	Testing of the individual modules for the entire system	Testing of the entire system as a whole together
Purpose	Ensure that each unit/module functions properly works in accordance with program specification	Ensure that one program can pass data successfully to another program	Ensure that the entire system meets the users' requirements as stated in the SRS (System Requirement Specification)	Ensure that the entire system consisting of many programs can work together as one whole system
Who Perform	Programmers who have been assigned	Programmers of the related programs	End-users (sometimes with assistance from the programmers)	End-users, development team operation group
Test Data	Mainly dummy data	Mainly dummy data	Both dummy and real data	Mainly real data

Additional Question:

Describe each of the above testing methods by using all the points given for a system.

Question 2

Performance (load, stress, volume) testing is usually an important stage in a test methodology.

(a) Explain the main **purpose** of performance (load, stress, volume) testing.

- ❖ Purpose of performance testings
  - **Test whether the system can meet the required performance objectives**
    - ➢ 2-sec response time
    - ➢ 5-min PO creating
    - ➢ supports certain amount of users
    - ➢ can support certain volume of transaction data (e.g., 500 POs, 400 RFQs)
  - **Test whether the system can achieve this objective given certain amount of data in future** (e.g., 10 years)
    - ➢ Transaction data volume (10 million)
    - ➢ Network traffic flow (10 million)
    - ➢ Number of users (5 million)

(b) Briefly explain **THREE (3)** the **contributions** (benefits) of automated testing tools in this stage of testing.

- **Save time & costs**
  - ➢ Time
    - ▪ It is time-consuming to manually create large stored data volumes.
    - ▪ It is difficult to manually stimulate the concurrent use of these data by a large number of actual users.
  - ➢ Costs
    - ▪ Testing tools help to reduce number of testers required and users.
    - ▪ If reduce 5 testers with monthly salary of RM10,000
    - ▪ Then, RM10,000 * 5 ppl * 3 months = RM150,000 has saved!
- **Predict performance**
  - ➢ System performance can be stimulated using automated tools

- such as LOADRUNNER, which allows tester to predict system performance when it is used by a large number of users.
- This stimulation may also reflect the concurrent use of other software
- as well as the characteristics of the hardware and the communication links used in the system.

- **Diagnosis**
  - Diagnosis out where the bottlenecks/problems are.
  - This action allows tester to feedback suggestions to the system designers
  - in order to identify and resolve the bottlenecks/problems.

Tutorial 12: System Implementation 1 – Installation and File Conversion

Question 1

A manufacturing company has decided to implement a new enterprise system consisting of some major modules which include inventory control, procurement, sales, production and accounting systems. This implementation is to replace the old legacy system. For the purpose of the above computerisation process, the company has been advised to purchase a medium-size mini-computer as the server and 100 PCs as the clients to be used in the various departments involved.

(a) Briefly explain **THREE (3)** main items of installation for hardware and **THREE (3)** main items of installation for software.

- **3 main hardware installations**
  - **Server**
    - Functions: -
      - Provides sharing of application software
      - Supports data-sharing
      - Performs data-processing tasks
    - Areas of installation: -
      - Preparation of site
      - Installation of software
        - DBMS
        - Application software (New enterprise system)
    - Examples: -
      - Mainframes
      - Mini-computer
  - **Clients**
    - Functions: -
      - Allows users to request for services from the server
      - Carries results' presentation from the server
    - Areas of installation: -
      - Connection of the server
      - Setup of software
        - client OS

- Examples: -
    - PCs, laptops, printers, scanners, readers, smartphones, etc.

- **Network infrastructure**
    - Functions: -
        - Connects clients to the server
        - Connects server to other servers, including customers' servers
    - Areas of installation: -
        - Modem, wires, routers, hubs, switches, etc.
    - Examples: -
        - Modem, wires, hubs, switches, and routers

❖ **3 main software installations**

- **Operating System (OS)**
    - Functions: -
        - Manages hardware
            - Server
            - Clients
            - Network infrastructure
        - Manages software resources
            - DBMS
            - Application software
    - Area of installation: -
        - Installation of OS into the server
        - Registration of licenses
        - Creation of users' accounts
    - Examples: -
        - MVS
        - OS/400
        - Unix
        - Linux

- **DBMS**
    - Functions: -

        - Allows edit, add, and delete
            - Data fields
            - Data records
            - Data tables
    - Area of installation: -
        - Installation of DBMS at database server
        - Registration of licenses
        - Creation of users' accounts
    - Examples: -
        - Oracle
        - DB2
- **Application software**
    - Functions (Enterprise system): -
        - Supports company's business processes
    - Area of installation: -
        - Installation of application software
        - Registration of the application software
        - Creation of users' accounts (for end-users)
    - Examples: -
        - Sales system
        - Purchasing system
        - Production system
        - Accounting system

(b) Briefly explain **THREE (3)** main areas of *preparation* necessary for the installation of the above **hardware**.

❖ **Preparation**

- **Power supply and communication lines**
    - Power supply
        - Ensures sufficient, reliable, and uninterruptable power supply
        - Utilises a 3-phase power for commercial applications
        - Prepares power backups

        - Uninterruptible power supply (UPS)
        - Generators
        - Powerbanks
    - Ensures sockets and multi-plugs are in good condition
- Communication lines
    - Ensures sufficient lines for phones and Internet purposes
    - Carefully layout for safety considerations

- **Site selection and preparation**
    - Prepares suitable locations to house the hardware such as server and clients
    - Factors to be considered
        - **Safety**
            - Safe from thefts
                - High walls
                - CCTVs
            - Safe from hackers
                - Security system
                - Access control (password)
            - Safe from fire
                - Smoke detectors
                - Sprinkler system (喷水灭火系统)
            - Safe from floods
                - Higher ground locations
        - **Cleanliness**
            - Free from dusts
        - **Distance**
            - Near to the users

- **Furniture and fittings**
    - Prepares tables for PCs, laptops, and printers
    - Prepares chairs for users
    - Prepares cabinets for spare parts such as mouse, keyboards, toners, and ink cartridge

- Prepares air-conditioners which are running 24 hours a week to provide conducive temperature for the server in order to prevent dusts and overheating.

- **Standby equipment and security**
  - **Standby equipment**
    - Electricity supply
      - UPS, generators, and powerbanks
    - Standby/Backup for the server
      - A minicomputer
  - **Security** [The answer regarding the security point is generated and taken by ChatGPT.]
    - Uses user authentication and accesses controls to permit only authorise personnel to access sensitive information.
    - Installs and keeps antivirus updated to guard against potential threats.
    - Considers using encryption protocols to secure data during transmission and storage, ensuring system integrity and data confidentially.
    - Conducts regular security audits and monitoring to proactively find and fix vulnerabilities.

Question 2

The above manufacturing company has already installed both the hardware and software necessary for its computerisation process. Now, it is ready for file creation and conversion from the old system.

Based on the above scenario, identify and briefly explain **THREE (3)** potential problems commonly faced during file conversion stage.

❖ **Potential File Conversion Problems**

- **Technical incompatibility of two systems**
  - It will not technically feasible to convert data when new software runs on a different hardware.
  - Solution: -
    - Prints out and enters manually into the new system.
- **Problems of new data fields**
  - Data fields that are not present in the current system or emerge/arise/appear new requirements.

- Examples: -
    - The proposed CUSTOMER data file includes gender data field.
    - A field is not found on the current CUSTOMER data file.

- **Problems of matching data fields**
    - No exact matching between data fields on the current and proposed system.
    - Fields may need to be combined or split up.
    - Example: -
        - "customer name" in the current file is contained in one single data field while it is to be split into two data fields namely, "first name" and "last name".
        - current "address" data field is to be split into three data fields namely, "block number", "street name", and "city".

- **Problems of new data files**
    - New system will have extra files.
    - Appropriate values of the files in these files have to b determined.
    - Example: -
        - A new Loyalty Points file has been created. This new file is not found in the old system.

- **Problems of different field lengths**
    - A data field length in the new system has different field length
    - compared to data field length in the old system.
    - Example: -
        - Telephone number field length for customer in the new system is 10-digit while old system has only 8-digit.

Tutorial 13: System Implementation 2 – Training and System Changeover

Question 1

A specialist insurance company has implemented an off-the-shelf software package to provide insurance premium quotations. There are currently **twenty-one** people employed as call-centre telephone operators.

Training

Various methods of training to the call-centre staff is being considered. The following three options are being considered:

1. **Public Course**: Sending each call-centre telephone operator on a public course held by a specialist training company. These courses are run in a fully equipped KL venue, which is within commuting distance of the call-centre. The course runs every month and the plan is to send a maximum of **three** staff each month. The course lasts three days and costs **RM650** per staff.
2. **In-House Training**: Requesting an external training company to run a specialised course for all call-centre telephone operators in-house at the call-centre location. A suitably sized meeting room is available. Up to eight delegates are allowed on each course. Each course lasts three days and is priced at **RM3,600** per course, excluding hire costs for computer hardware. There will also be costs associated with setting up the hardware and software.
3. **CBT**: Buying a CBT (computer-based training) package from an independent training company. This CBT package costs **RM120** for a single user licence. Twenty-one licences would have to be purchased. The CBT software runs on the workstations used by the call-centre staff.

Required:

Briefly describe **TWO (2)** advantages and **TWO (2)** disadvantages of each of these options.

Option	Advantages	Disadvantages
Public course	• Few staff members away from the office at any time, so remaining employees can cope with the additional workload. • **Exchange experiences** ▪ Employees have the opportunity to meet users who works for other companies previously and to learn from their ideas and experiences. • **Expert trainers** ▪ They can share their	• **Long time taken** to get everybody trained. ▪ It will be at least 6 months before all call-centre staff is trained. • **Standardised course content** ▪ The public course is likely to be very standardised. ▪ There may be little chance to discuss problems of using the software in the context of the company. • Most expensive method

	experiences and answer questions asked by the audience.	
In-house	• This option should allow delivery of training in a short-elapsed time. ▪ A course held every two weeks. ▪ The training would be completed within 5 weeks. • **Customised course content** ▪ This approach allows the course to be tailored to local requirements.	• If there are too many people away from their desk at any time, remaining employees will not be able to cope with the additional workloads. • **Major logistics arrangement** ▪ There may be problems in setting up the hardware and software environment. ▪ This may yet prove to be the costliest option. • **Expensive** ▪ May turn out to be the most expensive approach since more training sessions are required.
CBT	• **Cheapest option** ▪ Total cost appears to be at least 4 times cheaper than other two alternatives. (e.g., RM2520) • **Flexible learning time and pace** ▪ Employees can learn at their own rate. ▪ They can structure their learning around their individual requirements and working days.	• **Not an effective method** ▪ Employees may find it hard to motivate themselves to use the package to find the time and opportunity to use it. • **Absence of an expert trainer** ▪ There is no clear method of resolving problems that individuals encountered in the operation of application software package.

Question 2

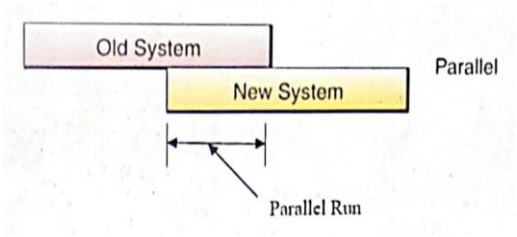
A manufacturing company has decided to replace its inventory control system. The current system was implemented ten years ago but has restricted reporting facilities and a text-based interface. It is to be replaced with a Windows-based package which undertakes the same basic functions, but is easier to use, has flexible reporting facilities and interfaces easily with other Windows-based software. Both systems run on the same hardware.

The manager of the project is now considering the details of implementation. He has been advised that he should consider both 'parallel running' and 'direct changeover/direct conversion'.

Required:

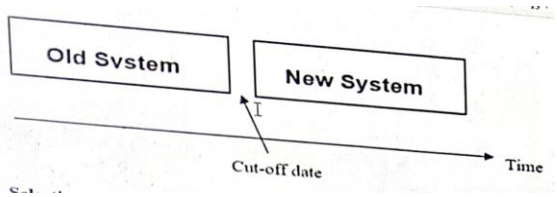
(a) Briefly explain what the terms 'parallel running' and 'direct changeover/direct conversion' mean.

- **Parallel running**



  - This method involves running of the old and new system side-by-side simultaneously.
  - Both systems will take in the same data inputs.
  - Outputs from both systems are compared to assess whether the new system is able to produce the right results.
  - This process will continue until the users are satisfied that new system can take over the old ones.
  - Then, the old system will be stopped and new ones continues.

- **Direct changeover**



  - Selecting a suitable cut-off date for changeover.
  - The cut-off date is a short period which could be over a week-end or public holiday, preferably during low peak business period.
  - **Before** cut-off: Some preparations especially testings are made and checked before the changeover.
  - **During** the changeover cut-off date especially Sunday night, the old system will be stopped while new system will take over immediately on Monday morning.

(b) Briefly describe **TWO (2)** advantages of 'direct changeover/direct conversion' over 'parallel running'.

❖ **Advantages of Direct Changeover**

➢ **Cost and time-saving**

- Direct changeover approach proves to be a more cost-effective and time-efficient implementation method compared to parallel running approach.
- Parallel running approach incurs substantial expenses related to entering data twice (duplicating data entry), staff overtime, temporary staffing, and checking/validating outputs against each other.
- In the direct changeover method, neither cost nor time overhead is incurred, as data is entered into the system only once.

➢ **Lack of commitment to the new system**

- Users of the system are usually familiar with the operation anf outputs of the current system.
- During parallel running, there may still be a tendency to rely on the old system.
- It is not properly identify and investigate the differences between outputs from the current system and proposed system.
- Significant problems may only be properly tackled when the current system is discarded.

➢ **Proper attention to system and user acceptance testing**

- Although the stages of the system and user acceptance testing are formally recognised in an approach using parallel running,
- there may be a tendency to underrate their importance because users are aware that the current system will be available as a "fail-safe" during implementation stage.
- The immediate nature of direct changeover means that proper attention has to be paid to both system testing and user acceptance testing.

➢ **Earlier use of the new system**

- Direct changeover is quick changeover from the old system to the new system.
- The users can use the new early unlike in parallel running which require long time.
- Early usage of the new system increases return on investment (ROI)

(c) Identify the main risk of direct changeover/direct conversion and suggest how this risk might be reduced for the manufacturing company's inventory control system implementation.

- **Risk of direct changeover**
  - When the new system is discovered to have errors and is unable to function/working properly,
  - the company will face problems as the old system has been discontinued and cannot serve as a backup or standby option.
- **Ways to reduce direct changeover risk**
  - **Thorough testing**
    - Thorough and complete testing of the software must be carried out (during software development phase) before changeover (system implementation phase).
    - Testings involve various types, such as UT, IT, ST, UAT, and LT.
    - This ensures system does not has any bugs/errors during changeover.
  - **Appropriate training**
    - Before changeover, staffs must attend appropriate, relevant, detail, and timely trainings.
    - This ensures they are well-equipped with necessary knowledge and skills for resolving problems arise during changeover.
  - **Contingency plan**
    - Contingency plan or recovery plan must be established within the company before implementing the changeover.
    - This plan may include: -
      - organising a recovery team by selecting staff
      - providing clear descriptions of team members' roles and responsibilities
      - preparing relevant and suitable standbys
    - Regular data backup must be conducted.

Question 3

First World Sdn. Bhd. plans to convert the old system to the new system. You have been consulted regarding suitable methods of conversion. While making recommendations, you must always consider the following factors:

- The new system must be completed all at once instead of being implemented in stages and modules.
- The risk of failure must be as low as possible.
- The implementation cost must be reasonable.

Recommend **ONE (1)** type of changeover method that the company should use and justify the reasons for using it.

- **Recommended changeover method**
  - **Direct changeover**
    - Main factor:
      - New system has been converted all at the same time rather than in stages.
    - DC is a quick changeover method
      - Requires shorter time and less manpower.
      - Helps in reducing costs.
    - Ways to reduce its high failure risk: -
      - System has thoroughly tested before changeover.
      - Staff has sufficiently trained before changeover.
      - Contingency plan is established to outline/describe the procedures for recovering the system during emergency situations.

Tutorial 14: System Operation and Maintenance

Question 1

A software house produces a software package for the insurance industry. The software house requires the purchaser of the software package to sign an annual contract for system maintenance. Currently, the purchasers (users) of the package have formed a very active User Group. There are many activities carried out by the members of the User Group. One of the most popular activities carried out by the User Group is to lobby for changes to be made to the current software package for improvements in its functionality and usability.

(a) Explain the main **purpose** of carrying out a system maintenance.

- **Purpose of system maintenance**
  - ensures the system will maintain an acceptable level of functionality for users
  - by making modifications and enhancements to the system as needed.

(b) By using an appropriate example, briefly describe the **THREE (3)** main types of system maintenance

- **Main types of system maintenance**
  - **Corrective maintenance**
    - It involves fixing any programming bugs and faults that arises during operation.
    - Aims to ensure the proper functioning of programs by rectifying issues promptly.
    - Example: -
      - Addressing programming bugs within the insurance system.
  - **Adaptive maintenance**
    - It is necessary for system to adapt evolving environment due to changes in the operational landscape of the software.
    - Changes in the environment can occur in 2 primary ways: -
      - Changes in business environment
        - Introduction of new regulatory requirements: -
          - ✓ new tax policies
          - ✓ laws related to food safety
          - ✓ banking regulation controlling loans
      - Changes in computer environment

- Changes in hardware or software changes
  - ✓ an operating system (OS) change

➢ **Perfective maintenance**

- It involves making enhancements to the system in response to user requests for new requirements.
- These new requirements may encompass: -
  - improvement to software usability
  - enhancement to the performance and functionality of the system
- Examples: -
  - Rewriting the staff appraisal system to enhance operation speed
  - Improving the usability of the interface for easier navigation (e.g., insurance renewal screen)
  - Enhancing the layout of selected insurance reports

(c) What is a maintenance contract?

❖ **Maintenance contract**

- ➢ A legal agreement signed between the users and computer service providers.
- ➢ The customers are required to pay an annual fee, typically calculated as a percentage of the original software or hardware cost specified in the contract.
- ➢ The contract is usually signed initially and is renewable on an annual basis.
- ➢ The service provider, under this agreement, is obligated to provide various services including repair, maintenance, updates, and upgrades to the customers.

Question 2

Great Assurance Ltd is an insurance company which has just implemented software package to provide insurance premium quotations for the general public and other functionalities. The package is an off-the-shelf package developed by Safe Software Ltd.

One of the criteria used for purchasing the insurance package from Safe Software Ltd was the level of system maintenance support provided by the software company. For such a maintenance support, a maintenance contract has to be signed. Being a customer of Safe Software Ltd, Great Assurance Ltd has also the option of joining the User Group.

(a) Explain **THREE (3)** main purposes of a software support and maintenance **contract**.

❖ **Services provided by the software supplier in the maintenance contract: -**

- **Help**
  - Helpline facility is provided.
  - Allows users to resolve problems efficiently.
- **Information**
  - Additional information, including Factsheets and newsletters, is offered to enhance users' understanding of utilising the software package.
- **Updates**
  - Software faults that emerge are promptly addressing through regular updates.
- **Upgrades**
  - Users have the opportunity to acquire/obtain new versions of the software at a discounted price.
- **Legal conditions**
  - Examples: -
    - Duration
    - Customers' obligations to use software
    - Liability of the suppliers

(b) Maintenance is often classified as either corrective, adaptive or perfective. The software supplier has agreed to make the following four changes to the software. Classify each of these four changes as either corrective, adaptive or perfective.

(i) Improve the usability of the interface;

- **Perfective**

(ii) Remove totalling errors from one of the management reports;

- **Corrective**

(iii) Add the new requirement of an audit trail to the software;

- **Perfective**

(iv) Enhance the layout of selected reports;

- **Perfective or Adaptive**

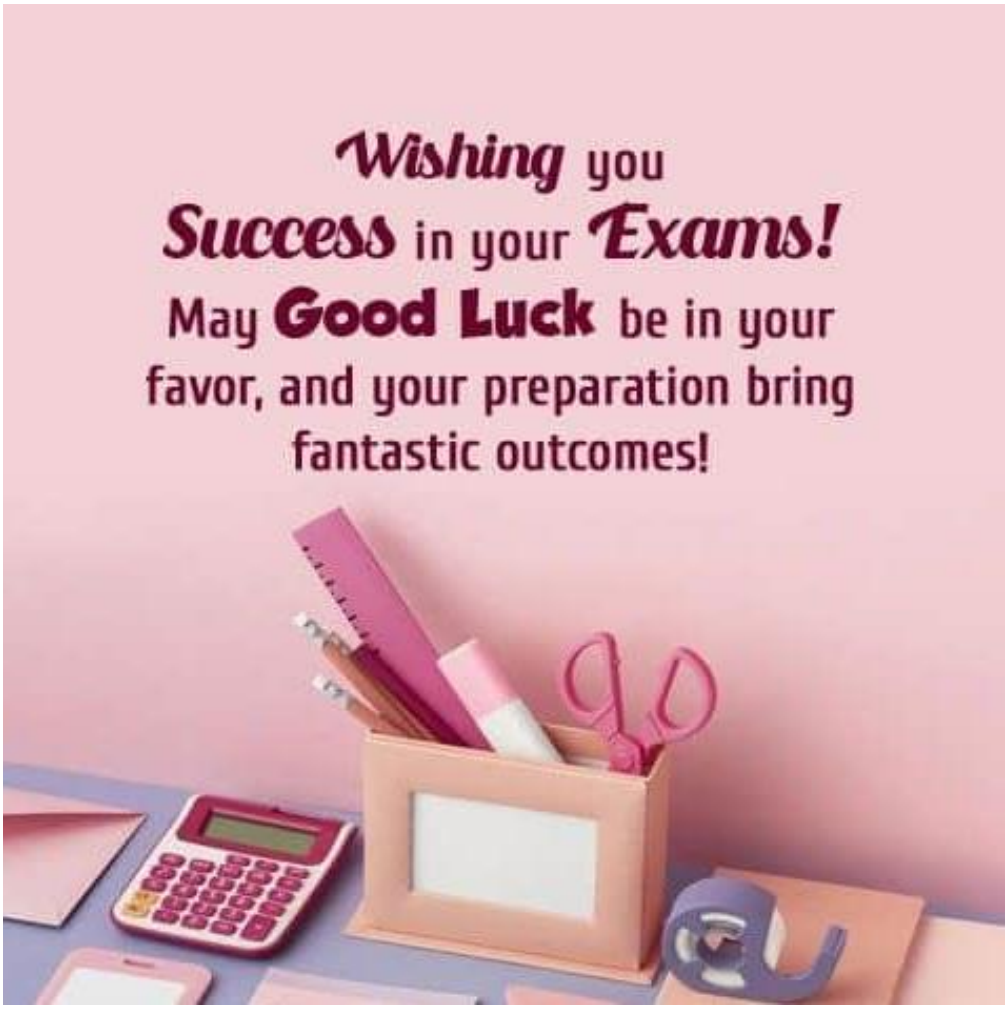
(v) A change in the insurance laws has led to the need to make some changes to the insurance package.

- **Adaptive**

(c) Explain **TWO (2) benefits** of a User Group membership to Great Assurance Ltd.

❖ **Benefits to customers**

- **Ideas for future development**
  - User-contributed ideas are incorporated into the new upgraded versions of the software, providing long-term benefits the users.
- **Arbiter**
  - The user group serves as an arbiter.
  - They help to resolve conflicts with the vendors,
  - particularly in areas of support and services, thereby protecting users' rights.
- **Exchange of views**
  - Users of a specific package can meet, either in person or over the internet, to exchange views.
  - This facilitates discussions on solutions, ideas or shortcuts to enhance productivity.



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