



**CERTIFIED PUBLIC ACCOUNTANT
FOUNDATION LEVEL 2 EXAMINATIONS
F2.3: INFORMATION SYSTEMS
DATE: TUESDAY, 29 NOVEMBER 2022
MARKING GUIDE AND MODEL ANSWERS**

QUESTION ONE

Marking guide

Question No	Description	Maximum Marks
(a)	Award 2 marks for each point below: <ol style="list-style-type: none">1. Project background and objectives of the proposed system2. A description of the current system and problems experienced with it3. An outline of a number of possible solutions and an evaluation of the feasibility of each4. A recommendation for a particular solution.	8 Marks
(b)	Award 2 marks for each point below: <ol style="list-style-type: none">1. Systems analysis2. Systems design3. Programming4. Testing5. Implementation (including conversion or changeover)6. Production and maintenance.	12 Marks

Model answers

a) **FOUR** parts that will likely be included in Kigali Appline Company's feasibility study report are:

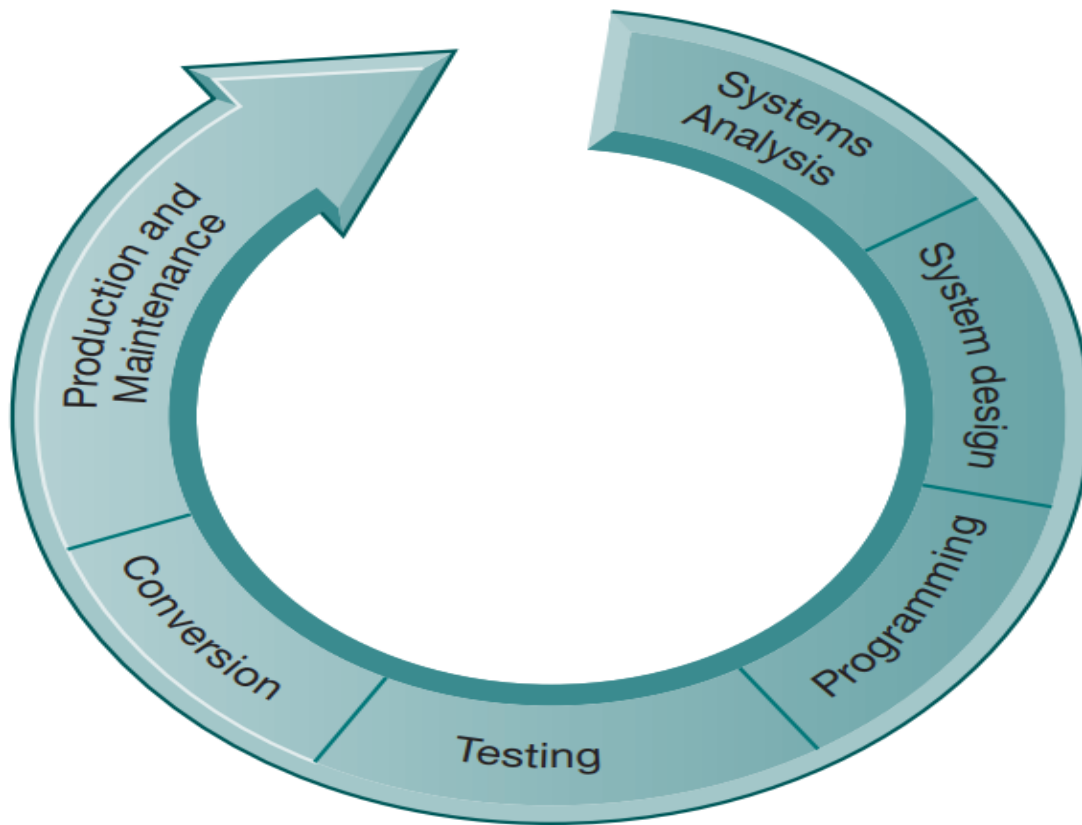
- Project background and objectives of the proposed system
- A description of the current system and problems experienced with it
- An outline of a number of possible solutions and an evaluation of the feasibility of each
- A recommendation for a particular solution.

b) **The SIX** core activities in system development are:

- Systems analysis
- Systems design
- Programming
- Testing
- Implementation (including conversion or changeover)
- Production and maintenance.

New information systems are an outgrowth of organizational problem solving. A new information system is built as a solution to some type of problem or set of problems the organization perceives it is facing. Systems development is a structured kind of problem solved with distinct activities. These activities consist of systems analysis, systems design, programming, testing, conversion, and production and maintenance. Figure 2.1 illustrates the systems development process. The systems development activities depicted usually take place in sequential order. But some of the activities may need to be repeated or some may take place simultaneously depending on the approach to system building that is being employed.

Figure 2.1: The Systems Development Process



Systems analysis: This is the analysis of a problem that a firm tries to solve with an information system. It consists of defining the problem, identifying its causes, specifying the solution, and identifying the information requirements that must be met by a system solution. The systems analyst creates a road map of the existing organization and systems, identifying the primary owners and users of data along with existing hardware and software. The systems analyst then details the

problems of existing systems. By examining documents, work papers, and procedures, observing system operations, and interviewing key users of the systems, the analyst can identify the problem areas and objectives a solution would achieve. Often, the solution requires building a new information system or improving an existing one. The systems analysis also includes a feasibility study to determine whether that solution is feasible, or achievable, from a financial, technical, and organizational standpoint.

Systems Design: Systems analysis describes what a system should do to meet information requirements, and systems design shows how the system will fulfill this objective. The design of an information system is the overall plan or model for that system. Like the blueprint of a building or house, it consists of all the specifications that give the system its form and structure. The systems designer details the system specifications that will deliver the functions identified during systems analysis. These specifications should address all of the managerial, organizational, and technological components of the system solution.

Programming: During the programming stage, system specifications that were prepared during the design stage are translated into software program code. Today, many organizations no longer do their own programming for new systems. Instead, they purchase the software that meets the requirements for a new system from external sources such as software packages from a commercial software vendor, software services from a software service provider, or outsourcing firms that develop custom application software for their clients.

Testing: Exhaustive and thorough testing must be conducted to ascertain whether the system produces the right results. Testing answers the question: Will the system produce the desired results under known conditions? Some companies are starting to use cloud computing services for this work. The amount of time needed to answer this question has been traditionally underrated in systems project planning. Testing is time-consuming: Test data must be carefully prepared, results reviewed, and corrections made in the system. In some instances, parts of the system may have to be redesigned. The risks resulting from glossing over this step are enormous. Testing an information system can be broken down into three types of activities: unit testing, system testing, and acceptance testing.

Implementation/Conversion: Conversion is the process of changing from the old system to the new system. Four main conversion strategies can be employed: the parallel strategy, the direct cutover strategy, the pilot study strategy, and the phased approach strategy. In a parallel strategy,

both the old system and its potential replacement are run together for a time until everyone is assured that the new one functions correctly. The direct cutover strategy replaces the old system entirely with the new system on an appointed day. The pilot study strategy introduces the new system to only a limited area of the organization, such as a single department or operating unit. The phased approach strategy introduces the new system in stages, either by functions or by organizational units. Moving from an old system to a new one requires that end users be trained to use the new system. Detailed documentation showing how the system works from both a technical and end-user standpoint is finalized during conversion time for use in training and everyday operations.

Production and Maintenance: After the new system is installed and conversion is complete, the system is said to be in production. During this stage, the system will be reviewed by both users and technical specialists to determine how well it has met its original objectives and to decide whether any revisions or modifications are in order. In some instances, a formal post-implementation audit document is prepared. After the system has been fine-tuned, it must be maintained while it is in production to correct errors, meet requirements, or improve processing efficiency. Changes in hardware, software, documentation, or procedures to a production system to correct errors, meet new requirements, or improve processing efficiency are termed maintenance. Routine maintenance consumes a large percentage of many firms' IT budgets, but could be reduced significantly through more up-to-date systems-building practices and technology.

QUESTION TWO

Marking guide

Question No	Description	Maximum Marks
(a)	2 Marks for a given definition of entities 2 Marks for a given definition of an attributes	4 Marks
(b)	Award 2 marks for each main methods of file organization below: 1. Sequential file organization 2. Direct file organization	6 Marks

	3. Indexed file organization	
(c)	<p>Award 1 mark for each benefit of the Kagobi University's office database management system below:</p> <ul style="list-style-type: none"> ○ Reduce the complexity of the information systems environment ○ Reduce data redundancy and inconsistency ○ Eliminate data confusion ○ Create program-data independence ○ Reduce program development and maintenance costs ○ Enhance flexibility ○ Enable ad-hoc retrieval of information; improve access and availability of information ○ Allow for the centralized management of data, their use, and security 	8 Marks
(d)	Award 2 marks for a given definition of Not only SQL Database	2 Marks

Model answers

- a)**
- An entity is a person, place, thing or event from which information can be obtained.
 - An attribute is a piece of information describing a particular entity.
- b) There are three main methods of file organization as explained below:**
- Sequential file organization: In this method of file organization records are organized in order of the key field. If a particular record is required in a sequential file, all the prior records must be read before the required record is reached.
 - Direct file organization: Direct file processing or direct access allows the computer to go directly to the desired record by using a record key. To retrieve a record a formula is applied to the record key. The result is the disk address of the particular record. This operation is referred to as hashing. The record key is generated by the system. Direct access retrieves specific records quickly.
 - Indexed file organization: This method of file organization is a form of compromise between the sequential and direct methods. The indexed file is made up of two files. The first file is a sequential file where the data is stored. The second file is an index file. It contains entries consisting of the key to each record and the address of that record. For a record to be accessed directly the key must be located in the index file and the address retrieved. The address is then used to retrieve the required record.

c) Eight benefits of University of Rwanda registrar's office database management system are outlined below:

- Reduce the complexity of the information systems environment
- Reduce data redundancy and inconsistency
- Eliminate data confusion
- Create program-data independence
- Reduce program development and maintenance costs
- Enhance flexibility
- Enable ad-hoc retrieval of information; improve access and availability of information
- Allow for the centralized management of data, their use, and security

d) A Not-only SQL (NoSQL) database is a non-relational database that is highly scalable, fault tolerant and specifically designed to house semi-structured and unstructured data.

QUESTION THREE

Marking guide

Question No	Description	Maximum Marks
(a)	<p>1 Mark for each point given below for a business intelligence purpose at the different management levels:</p> <ul style="list-style-type: none"> ➤ Senior executives use it to monitor operations and often rely on graphical outputs such as dashboards to see summaries. ➤ Middle managers tend to use ad-hoc queries and analysis to get a deeper understanding of what is happening in the organization. ➤ Operational managers and staff rely on predefined reports such as sales forecasts, order delivery, inventory levels. <p>2 Marks for any other valid point</p>	6 Marks
(b)	Award 1 mark for well described stages in the decision-making process (Intelligence, Design, Choice and implementation) and 1 mark for how each can be supported by information system.	8 Marks
(c)	2 Marks for each purpose of business intelligence	6 Marks

Model answers

a) The majority of Kigali Tech business intelligence services & solutions in Rwanda users depend on predefined reports. **Below are the THREE business intelligence purposes at the different management levels.**

- Senior executives use it to monitor operations and often rely on graphical outputs such as dashboards to see summaries.
- Middle managers tend to use ad-hoc queries and analysis to get a deeper understanding of what is happening in the organization.
- Operational managers and staff rely on predefined reports such as sales forecasts, order delivery, inventory levels.

b) **Below are the 4 stages in the decision-making process and how each can be supported by information systems.**

- **Intelligence:** This stage involves identifying and understanding the problems that are present in the organization and their root cause and effect. MIS systems that provide a wide range of detailed reports and information can help in identifying problems.
- **Design:** This stage involves identifying and investigating a number of possible approaches and solutions to the problem. DSSs are ideal in this stage for exploring alternatives because they include tools for analyzing and modeling data, thus enabling users to explore various options quickly.
- **Choice:** This stage involves choosing from alternative solutions. DSSs can support managers in choosing the optimal solution. These DSSs can use complex analytic models to look at the various potential outcomes.
- **Implementation:** This stage involves implementing the chosen solution and monitoring to establish if the solution works. An MIS can be used to provide managers with routine reports on the progress of the solution.

c) **Below are the THREE purposes of BI.**

- Senior executives use it to monitor operations and often rely on graphical outputs such as dashboards to see summaries.
- Middle managers tend to use ad-hoc queries and analysis to get a deeper understanding of what is happening in the organization.
- Operational managers and staff rely on predefined reports such as sales forecasts, order delivery, inventory levels

QUESTION FOUR

Marking guide

Question No	Description	Maximum Marks
(a)	2 marks for each definition between hub and a switch	4 Marks
(b)	2 marks for each key digital networking technologies below: <ul style="list-style-type: none">○ Client/server computing;○ The use of packet switching;○ Development of widely used communications standards such as TCP/IP.	6 Marks
(c)	2 Marks for each main type of network topologies below: <ul style="list-style-type: none">○ In a star topology○ In a bus topology	6 Marks
(d)	2 marks for each type of physical transmission media below: <ul style="list-style-type: none">○ Twisted pairs○ Coaxial cable	4 Marks

Model answers

a) The difference between hub and switch is discussed below:

A Hub is a networking device that allows you to connect multiple PCs to a single network. It is used to connect segments of a LAN. A hub stores various ports, so when a packet arrives at one port, it is copied to various other ports. Hub works as a common connection point for devices in a network whereas switch is a computer networking device that connects various devices together on a single computer network. It may also be used to route information in the form of electronic data sent over networks.

Switch is more efficient than the hub. A switch can join multiple computers within one LAN, and a hub just connects multiple Ethernet devices together as a single segment. Switch is more intelligent than a hub to determine the target of the forwarding data.

b) Important Telecommunications Technologies Modern digital networks and the Internet are based on three key technologies as follows:

- Client/server computing;
- The use of packet switching;
- Development of widely used communications standards such as TCP/IP.

c) A network topology defines the physical connections of hosts in computer network. There are three main types of network topologies. These are:

- In a star topology, all devices on the network connect to a single hub and all network traffic flows through the hub.
- In a bus topology, one station transmits signals, which travel in both directions along a single transmission segment. All of the signals are broadcast in both directions to the entire network, with special software to identify which device should receive each message.
- A ring topology connects network devices in a closed loop. Messages pass from computer to computer in only one direction around the loop and only one station at a time

d) TWO types of physical transmission media to carry messages from one device to another are:

- Twisted pairs: Twisted pairs of copper wires are used mostly for analogue voice signals but also for data.
- Coaxial cable: Coaxial cable consists of a single, thickly insulated and shielded copper wire, which can transmit a large volume data than twisted pair

QUESTION FIVE

Marking guide

Question No	Description	Maximum Marks
(a)	1 mark for each given attribute of quality information useful to organizations	6 Marks
(b)	1 mark for each benefit provided for a big data (Max. 4 marks)	4 Marks
(c)	2 Marks for each point given on key management challenges involved in building, operating, and maintaining information systems	10 Marks

Model answers

a) Below are SIX attributes that should be possessed by information in print-on-demand service for it to be useful to organizations.

- Completeness: Information should be complete – in other words all information which is relevant to a decision should be provided.
- Accuracy: Information should be free of errors and bias. The degree of accuracy required is relative to the intended use of the information. For example, an invoice must be accurate to the nearest RWF whereas a sales forecast might be rounded to the nearest RWF1000.
- Relevant for purpose: Information should be relevant to its purpose.
- Timely: Information needs to be up to date; information has little value if it is out of date.
- Reputable source: For information to be used effectively, the managers or users of the information must have confidence in the source of the information.
- Value: The value of the information should be greater than the cost of producing it.
- Information has value if it leads to decisions that reduce costs, eliminate losses, increase sales and allows for better utilization of resources

b) The results obtained through the processing of Big Data can lead to a wide range of insights and benefits as listed below.

- Operational optimization
- Actionable intelligence
- Identification of new markets
- Accurate predictions
- Fault and fraud detection
- More detailed records
- Improved decision-making
- Scientific discoveries

c) Below are some key management challenges involved in building, operating and maintaining the print-on-demand service information system.

- The strategic business challenge is how information technology can be used to design organizations so that are competitive, effective and digitally enabled.
- The globalization challenge facing organizations is how organizations understand the system requirements of a global economic environment.
- The information architecture and infrastructure challenge is that organizations must be able to develop an information architecture that is able to support the company goals when both the business conditions and the technologies are changing so rapidly.
- The information systems investment challenge is how organizations determine the business value of systems.

- The responsibility and control challenge is how organizations can ensure that their information systems are used in an ethical and socially responsible way.

QUESTION SIX

Marking guide

Question No	Description	Maximum Marks
(a)	2 marks for each given uses of data warehouses to the users	6 Marks
(b)	1 mark for each outlined type of information obtainable from data mining and 1mark for explanation	8 Marks
(c)	2 Marks for each point given on a way through which web data mining looks for patterns in data	6 Marks

Model answers

- a) The main purpose of data warehouse is to collect data from different resources (Operation Database) and help in Query and Analytics but at the end representation will be done to help Decision maker to make special Decision.

Below are some uses of Data warehouses.

- Extract archived operational data
- Overcome inconsistencies between different legacy data formats
- Integrate data from throughout an enterprise, regardless of location or format
- Incorporate additional information

b) Four data mining techniques.

- Associations: when one occurrence can be correlated to another occurrence.
- Sequences: or one event leads to another event.
- Recognition of patterns and the creation of new organization of data - for example analyzing purchases to create customer profiles.
- Forecasting future trends as a result of finding patterns in the data.

• **Associations:** These are occurrences linked to a single event. For instance, a study of supermarket purchasing patterns might reveal that, when corn chips are purchased, a cola drink is purchased 65 percent of the time, but when there is a promotion, cola is purchased 85 percent of the time. This

information helps managers make better decisions because they have learned the profitability of a promotion.

- **Sequences:** In sequences, events are linked over time. We might find, for example, that if a house is purchased, a new refrigerator will be purchased within two weeks 65 percent of the time, and an oven will be bought within one month of the home purchase 45 percent of the time.

- **Classification:** These recognize patterns that describe the group to which an item belongs by examining existing items that have been classified and by inferring a set of rules. For example, businesses such as credit card or telephone companies worry about the loss of steady customers. Classification helps discover the characteristics of customers who are likely to leave and can provide a model to help managers predict who those customers are so that the managers can devise special campaigns to retain such customers.

- **Clustering:** This works in a manner similar to classification when no groups have yet been defined. A data mining tool can discover different groupings within data, such as finding affinity groups for bank cards or partitioning a database into groups of customers based on demographics and types of personal investments.

- **Forecasting:** Although these applications involve predictions, *forecasting* uses predictions in a different way. It uses a series of existing values to forecast what other values will be. For example, forecasting might find patterns in data to help managers estimate the future value of continuous variables, such as sales figures.

c) Web mining can be broadly divided into three categories.

- Web content mining extracts knowledge from the content of Web pages
- Web structure mining inspects data related to the structure of a particular site
- Web usage mining examines user interaction data recorded by a Web server whenever requests for a Web site's resources are received.

QUESTION SEVEN

Marking guide

Question No	Description	Maximum Marks
(a)	2 marks for each given ways in which shema online's information systems will enhance its business processes	4 Marks
(b)	1 mark for each outlined type of functional information system and 1 mark for explanation	8 Marks
(c)	1 mark for each outlined type of main enterprise applications and 1 mark for explanation	8 Marks

Model answers

a)

- Shema online in Rwanda Information systems will enhance business processes by increasing the efficiency of existing processes
- Shema online in Rwanda Information systems will enhance business processes enabling entirely new processes that have the potential to transform the business.

b) There are four primary types of information systems that serve different functional areas.

- Sales and Marketing: Systems Sales and marketing information systems assist the firm in marketing and sale of products and services to customers. An important operational system in this area is the sales order processing system which is used to capture customer orders. At a strategic level, information systems are used to forecast trends.
- Manufacturing and Production Systems: Manufacturing and production information systems deal with the planning, development and production of products. An important system in this area is an inventory system which is used to provide information about the number of items held in inventory to support manufacturing and production activities.
- Finance and Accounting Systems: Finance and accounting information systems keep a record of the firm's financial assets and the flow of funds. The finance function is responsible for managing the firm's financial assets such as cash, shares and other investments. To establish if the firm is getting the best return on its investments, the finance function must obtain information from both external and internal sources. The accounting function is responsible for maintaining and managing the firm's financial records. The accounting function attains information mainly from sources internal to the firm. An accounts receivable system is an example of a system used by the

financial and accounting functional area. It tracks and stores important customer data, such as payment history, credit rating and billing history. Other systems used in this area include accounts payable and budgeting systems.

- Human Resources Systems: Human resources information systems maintain employee records, record employee skills, job performance and training, and assist planning of employee compensation and career development. An example of a system used in the human resources area would be a performance appraisal tracking system which is used to track details of each employee's performance evaluations.

- c) Enterprise applications are systems that span functional areas, focus on carrying out business processes across the business firm and encompass all levels of management. Enterprise applications assist businesses in becoming more flexible and productive by coordinating their business processes more closely.

The four main enterprise applications are:

- Enterprise systems
- Supply chain management systems
- Customer relationship management systems
- Knowledge management systems

Enterprise Systems

Enterprise systems, or enterprise resource planning (ERP) systems, model and automate many business processes, for instance filling an order or scheduling a shipment, with the objective of integrating information throughout the company and eradicating complex, costly links between computer systems in different areas of the business. Information that was in the past split between different systems can now effortlessly flow throughout the company, allowing it to be shared by business processes in manufacturing, accounting, human resources and other areas of the organisation. Distinct business processes from sales, production, finance and logistics can be integrated into company-wide business processes that flow across organisational levels and functions. The enterprise system assembles data from a range of key business processes and stores the data in a single comprehensive data repository where it can be utilised by other parts of the business. Managers are provided with information that is more accurate and timelier for assisting in the coordination of the daily operations of the business and a firm-wide view of business processes and information flows.

Supply Chain Management

Systems Supply chain management (SCM) systems facilitate businesses with managing relationships with their suppliers. These systems help suppliers, purchasing firms, distributors and logistics companies share information about orders, production, inventory levels, and delivery of products and services so that they can source, produce and deliver goods and services more

efficiently. SCM systems increase firm profitability by reducing the costs associated with moving and manufacturing products and by enabling managers to make better decisions about how to organise and schedule sourcing, production and distribution. Supply chain management systems are a form of inter-organisational system because they automate the flow of information across organisational boundaries. Firms that carefully manage their supply chains get the correct amount of products from their source to the point of consumption in the minimum amount of time and at the lowest cost. Customer orders, shipping notifications, optimised shipping plans and other supply chain information, flow between the Warehouse Management System (WMS), Transportation Management System (TMS), and its back-end corporate systems.

Customer Relationship Management Systems

Customer relationship management (CRM) systems focus on coordinating the business processes regarding a firm's interactions with its customers in sales, marketing and service, to fully optimise profits, customer satisfaction and customer retention. They merge customer data from numerous sources and communication channels to enable firms to identify profitable customers, acquire new customers, improve service and support and target products and services more accurately to particular customers' preferences.

Knowledge Management Systems

The value of a firm's products and services is based not only on its physical resources but also on intangible knowledge assets. Some firms perform better than others because they have superior knowledge regarding the creation, production, and delivery of products and services. Knowledge management systems support processes for discovering, codifying, sharing, and distributing knowledge, as well as processes for generating new knowledge and integrating external sources of knowledge.

END OF MARKING GUIDE AND MODEL ANSWERS