# KASNEB

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**CERTIFIED INFORMATION COMMUNICATION TECHNOLOGISTS (CICT) EXAMINATION**

**REVISED SYLLABUS (ADVANCE COPY)**

**JULY 2015**

# SUMMARY OF THE CERTIFIED INFORMATION COMMUNICATION TECHNOLOGISTS (CICT) EXAMINATION REVISED SYLLABUS

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## ICT Project

**PAPER NO.1 INTRODUCTION TO COMPUTING**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to apply computing skills in an organisation

## 1.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Select appropriate computer hardware and software
- Apply data processing principles
- Demonstrate competence in basic computer operations
- Select appropriate information systems in an entity
- Control information systems threats

**CONTENT**

### 1.1 Introduction to information communication technology (ICT)

- Elements of a computer system
- Types of computers
- Evolution of computers
- Computer peripherals and interfaces
- Uses of computer systems
- Impact of ICT in society

### 1.2 Computer hardware

- Input devices
- Processing devices
- Memory
- Storage devices
- Output devices
- Communication devices
- Components of a computer system
- Primary storage devices
- Secondary storage devices and media
- Input/output devices
- Communication devices
- Selection of computer hardware

### 1.3 Computer software

- Systems software
- Application software
- User interface
- Selection of computer software

### 1.4 Computer start up/booting

- Sources of power
- Power protection
- Booting
- BIOS and BIOS setup

1.5 **Software installation**

- Installation procedures
- Types of installations
- Installers
- Uninstalling software
- Configuration

1.6 **Keyboard and mouse skills**

- Types of keyboards
- Keyboard layout
- Typing skills
- Keyboard ergonomics
- Mouse skills

1.7 **Number systems, computer arithmetic and set theory**

- Computer codes (BCD, ASCII and EBCDIC)
- Zoned decimal and packed decimal formats
- Number systems
- Number systems conversions
- Binary arithmetic
- Sets and set theory

1.8 **Data processing cycle**

- Introduction to data processing
- Data input, output and control
- File organisation and access
- Data collection methods
- Data capture methods
- Methods of data processing
- Data processing systems
- Data processing modes
- Data hierarchy

1.9 **Logic, truth tables and circuits**

- Conjunction
- Disjunction
- Negation
- Proportions and truth tables
- Tautologies and contradictions
- Logical equivalence
- Conditional and bi-conditional statements
- Arguments and logical implications
- Simplification of logic circuits: Boolean expressions, AND-OR circuits

1.10 **Basic computer networking**

- Networking terms
- Components of computer networks
- Types of computer networks
- Advantages and disadvantages of networking
- Internet use and benefits

## 1.11 Basic troubleshooting

- Hardware errors
- Hardware troubleshooting techniques
- Software errors
- Hardware troubleshooting tools
- Software trouble shooting techniques
- Software troubleshooting tools

## 1.12 Emerging issues and trends

**PAPER NO. 2 COMPUTER APPLICATIONS - PRACTICAL**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to perform basic computer operations

2.0    **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Install and uninstall appropriate software
- Use an operating system for file management
- Use a word processor
- Make a presentation using presentation packages
- Use a spreadsheet
- Use a database package
- Use a desktop publishing package
- Use application packages to create business solutions.

**CONTENT**

2.1    **Basic operations**

- Starting up the computer
- Managing files and folders
- Plugging in, preparing and ejecting storage devices
- Loading applications

2.2    **Word Processing software**

- Using features of a word processor
- Creating and retrieving existing documents
- Setting page setup features
- Using toolbars
- Formatting and editing text
- Manipulating a document using shortcut keys
- Creating and formatting tables
- Creating and formatting images and drawing
- Inserting and editing headers and footers
- Proofreading a document
- Using mail merge tool
- Tracking changes and comments
- Converting documents
- Linking and embedding
- Creating table of content, list of figures and list of tables
- Saving a document
- Automating simple tasks
- Printing a document

2.3    **Spreadsheet software**

- Using features of a spreadsheet
- Creating , saving and retrieving existing workbook
- Editing and cell navigation
- Formatting worksheets
- Manipulating data using different Cell referencing methods
- Using formulae and functions
- Sorting, filtering and data validation

- Analysing data using what if analysis
- Inserting charts and graphs including pivot tables
- Summarising, consolidating and outlining data
- Automating simple tasks
- Printing worksheets

2.4 **Presentation software**

- Using features of a presentation program
- Inserting a slide, typing and formatting text in a slide
- Importing and exporting content
- Working with master slides and templates
- Editing slide content
- Drawing and formatting various objects
- Working with graphics and charts
- Inserting and formatting images
- Animation effects
- Reviewing presentation
- Saving, copying and deleting slides
- Presentation views
- Automating simple tasks
- Printing handouts and slides

2.5 **Database software**

- Using features of a database
- Creating, saving and retrieving existing database
- Identifying fields, data types, records and tables
- Establishing relationships between tables
- Manipulating data
- Searching data
- Sorting and filtering
- Adding charts, diagrams, tables and attachments
- Securing a database
- Automating simple tasks
- Configuring database start up options
- Printing from a database

2.6 **Using a desktop publishing software**

- Using features of desktop publishing software
- Creating different types of publications
- Creating, saving and retrieving files
- Setting page layout
- Typing and manipulating text
- Working with toolbars
- Identifying and using various icons in toolbars of the program including toolbox
- Drawing and manipulating various shapes
- Using the colour palette
- Inserting the colour palette
- Inserting and manipulating images
- Importing and exporting files
- Setting borders
- Using merge tool
- Working with tables
- Designing and creating simple websites
- Automating simple tasks

- Printing a publication

## 2.7 Emerging issues and trends

**PAPER NO.3 ENTREPRENEURSHIP AND COMMUNICATION**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with knowledge, skills and attitudes that will enable him/her to apply entrepreneurial and communication skills in business and other environments

3.0 **LEARNING OUTCOMES**
  A candidate who passes this paper should be able to:
  - Identify and screen viable business opportunities
  - Develop a business plan
  - Demonstrate entrepreneurial orientation
  - Communicate effectively in a business environment
  - Apply entrepreneurial competencies in response to the emerging trends in the business environment

**CONTENT**

3.1 **Introduction to entrepreneurship**
  - Definition of entrepreneurship
  - Rationale for entrepreneurship
  - Entrepreneurial decision process
  - Entrepreneurial development
  - Contribution to economic development

3.2 **Entrepreneurship orientation**
  - Independence and need for achievement
  - Individual characteristics of entrepreneurs
  - Creativity and innovation
  - Decision making
  - Risk management
  - Time management
  - Coping with competition

3.3 **Entrepreneurial opportunity and development**
  - Methods of generating ideas
  - Qualities of good business opportunities
  - Evaluating business opportunities
  - Feasibility analysis
  - Business incubation
  - Intellectual properties, copyrights  trademarks and patents

3.4 **Business plan**
  - Purpose
  - Format
  - Description of the business
  - The market and marketing plan
  - Operations and production plan
  - The human resources plan
  - The financial plan
  - Launching the new venture

3.5    **Strategies for enterprise growth**
-        Penetration strategy
-        Market development strategy
-        Product development strategy
-        Franchising
-        Joint ventures
-        Mergers and acquisitions
-        Going public

3.6    **Entrepreneurship and technology**
-        Internet and e-commerce
-        The enterprise website
-        Globalisation
-        Business outsourcing
-        Techpreneurs
-        Electronic and mobile money transfers
-        Business networking
-        Crowd funding and crowd sourcing

3.7    **Nature of business communication**
-        Meaning of communication
-        Purposes of business communication
-        Internal and external communication
-        The communication process
-        Methods of communication
-        Communication systems and networks
-        Principles of effective communication
-        Barriers to effective communication

3.8    **Written communication**
-        Rules of effective writing
-        Business correspondence
-        Reports
-        Memorandum
-        Proposal writing
-        Forms and questionnaire design
-        Circulars and newsletters
-        Notices and advertisements
-        Publicity materials
-        Press releases
-        Graphic communication

3.9    **Oral and non-verbal communication**
-        Oral communication in business
-        Effective listening
-        Interviews
-        Non-verbal communication
-        Interpersonal relationships
-        Presentations skills

3.10   **Meetings**
-        Notice
-        Agenda

- Role of the chairperson
- Role of the secretary
- Conduct of meetings
- Minutes

### 3.11 Information technology and communication
- The internet
- Teleconferencing
- Wireless technologies
- Electronic postal services

### 3.12 Ethics and integrity in business communication
- Concept of ethics and integrity
- Significance of ethical communication
- Factors influencing ethical communication
- Ethical dilemmas in communication
- Guidelines to handle communication ethics dilemmas
- Business ethics in communication

### 3.13 Emerging issues and trends

**PAPER NO. 4 OPERATING SYSTEMS - PRACTICAL**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to manage operating systems in an organisation

4.0 **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Install, update and uninstall operating systems
- Manage files and directories using an operating system
- Configure an operating system to handle various tasks
- Handle maintenance and performance issues of an operating system
- Troubleshoot operating systems
- Secure data using an operating system
- Manage user accounts.

**CONTENT**

4.1 **Introduction to operating systems**

- Definition of an operating system
- History of operating systems
- Functions of operating systems
- Types of operating systems
- Interfaces
- Computer hardware review
- Operating system installation
- System calls
- Operating system structures
- Selecting an operating system

4.2 **Installing an operating system**

- Pre installation tasks
- Installation tasks
- Installation methods
- Installation process
  - Installing operating system
  - Uninstalling operating system
  - Reinstalling operating system
  - Upgrading operating system
- Multiboot configuration
- Troubleshooting operating systems

4.3 **Processes and threads**

- Processes
- Threads
- Inter-process communication
- Classical IPC problems
- Scheduling
- Memory management

4.4     **Deadlocks**

- Resources
- Introduction to deadlocks
- The Ostrich algorithm
- Deadlock detection and recovery
- Deadlock avoidance
- Deadlock prevention

4.5     **Workgroups and domains**

- Workgroups
- Joining a workgroup
- Domains
- Joining a domain
- Creating user accounts

4.6     **Using management console and scheduler**

- Management consoles
- Snap-ins
- Using consoles
- Using scheduler

4.7     **Control panel**

- Overview of control panel
- Accessing control panel items
- Changing the settings of the control panel items

4.8     **Configuring hardware settings**

- Viewing hardware profile
- Creating or modifying hardware profile
- Activating and deactivating hardware profile
- Plug and play hardware
- Add/remove hardware
- Troubleshooting hardware

4.9     **Configuring the display**

- Setting display properties
- Setting multiple display
- Using multiple display
- Troubleshooting

4.10    **Configuring operating system settings**

- Performance option
- Environment variables
- Start up and recovery settings
- Troubleshooting operating system

4.11    **Using registry**

- Accessing the registry
- Structure of the registry
- Using the registry editor

### 4.12 Disk management

- Installing a hard disk
- Formatting a hard disk
- Setting up hard drives
- Analyzing hard disks
- Defragmenting hard disks
- Partitioning a hard disk
- Working with different volume types
- Upgrading a hard disk
- Managing disks on a remote computer
- Managing disk quarters

### 4.13 File systems management

- Creating files and directories
- Mounting drives on different file system
- Sharing files and folders
- Securing files and folders
- Securing resources using NTFS permissions

### 4.14 Emerging issues and trends

**PAPER NO. 5   PRINCIPLES OF ACCOUNTING**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with knowledge, skills and attitudes that will enable him/her to prepare financial statements for different entities including non-complex group structures

### 5.0   LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Prepare books of original entry and basic ledger accounts under double entry system
- Prepare basic financial statements of sole traders, partnerships, companies and manufacturing entities and not for profit organisations
- Comply with the regulatory framework in the accounting field
- Account for assets and liabilities
- Analyse financial statements by use of ratios and statement of cash flows
- Prepare financial statements for non-complex group structures

## CONTENT

### 5.1   Introduction to Accounting

- The nature and purpose of accounting
- Objectives of accounting
- Users of accounting information and their respective needs
- The accounting equation
- Qualities of useful accounting information
- Regulatory framework of accounting (regulatory bodies such as ICPAK, IFAC, IASB, Accounting standards (IAS/IFRS), their importance and limitations and professional ethics)
- Accounting concepts/principles

### 5.2   Recording transactions

- Source documents (quotations, purchases order, statement of account, remittance advice, receipts,  petty cash vouchers, sales and purchase invoices, credit notes and debit notes, bank statements)
- Books of original entry; sales journal, purchases journal, returns inward, returns outward journal, cashbook, petty cashbook and general journal
- Double entry and the ledger; general ledger, sales ledger, purchases ledger
- The trial balance
- Computerised accounting systems- Role of computers, application and accounting softwares in the accounting process, benefits and challenges of operating computerised accounting systems

### 5.3   Accounting for assets and liabilities
#### 5.3.1   Assets
- Property, plant and equipment – recognition, capital and revenue expenditure, measurement (depreciation and revaluation), disposal and disclosures – property, plant and equipment schedule

- Intangible assets – recognition, measurement (amortisation, impairment and revaluation), disposals and disclosures.
- Inventory – recognition, measurement and valuation using specific cost method (FIFO and weighted average cost)
- Trade receivables – bad debts and allowance for doubtful debts and receivables control accounts
- Accrued income and prepaid expenses
- Cash at bank – cashbook and bank reconciliation statement
- Cash in hand – cash book and petty cash book

### 5.3.2 Liabilities
- Bank overdraft – cash book and bank reconciliation
- Trade payables – payables control accounts
- Loans – accounting treatment of repayment of principal and interest
- Prepaid income and accrued expenses

### 5.4 Correction of errors and suspense account

### 5.5 Financial statements of a sole trader
- Income statement
- Statement of financial position

### 5.6 Financial statements of a partnership
- Partnership agreement
- Distinction between current and fixed capital
- Income statement
- Statement of financial position

### 5.7 Financial statements of a company
- Types of share capital – ordinary shares and preference shares
- Issue of shares (exclude issue by instalment and forfeiture)
- Types of reserves – share premium, revaluation reserve, general reserves and retained profits
- Income tax -Accounting treatment and presentation (exclude computation)
- Financial statements – Income statement and statement of financial position
- Published financial statements –description of a complete set of published financial statements only

### 5.8 Financial statements of a manufacturing entity
- Features of a manufacturing entity
- Classification and apportioning costs between manufacturing and selling and administration
- Financial statements – manufacturing account, income statement and statement of financial position

### 5.9 Financial statements of a not- for- profit organisation
- Features
- Types of funds and their accounting treatment

-     Income and expenditure account
-     Statement of financial position

### 5.10   Group accounts
-     Consolidated income statement and consolidated statement of financial position (simple group structures comprising a holding company and one subsidiary company and/or one associate company)
-     Consolidated statement of cash flow

### 5.11   Analysing financial statements
-     Statement of cash flows (categories of cash, methods of preparing statement of cash flows and the importance)
-     Financial ratios – definition, categories, analysis and interpretation, application and limitations

### 5.12   Financial statements of public sector entities
-     Features of public sector entities (as compared to private sector)
-     Structure of the public sector (National and county governments, state corporations and other agencies)
-     Regulatory structures and oversight [IPSASB, PSASB (establishment, mandate and functions), Director of Accounting Services, National Treasury, Parliamentary Committees, Accounting Officers at national and county levels)
-     Objectives of public sector financial statements
-     Objectives of IPSAS
-     Accounting techniques in public sector (budgeting, cash, accrual, commitment and fund)

    (Preparation of financial statements should be excluded)

### 5.13   Emerging issues and trends

**PAPER NO. 6 COMPUTER SUPPORT AND MAINTENANCE**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her support and maintain computers in an organisation

6.0    **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Operate computer hardware and software
- Install and uninstall operating systems and application programs
- Troubleshoot computer hardware
- Disassemble and reassemble a computer system
- Identify and replace faulty components
- Undertake effective selection and acquisition of computer systems
- Back-up data and information

**CONTENT**

6.1    **Basic computer concepts**
- Microcomputer electronic components
- The physics of electronics
- The use of maintenance tools

6.2    **Power supply**
- Overview of power supply
- Power supply problems
- Power supply protection devices
- Using power supply devices

6.3    **Motherboards**
- Computer cases
- Types of motherboards
- Installing a motherboard
- Motherboard components
- Using expansion slots and connectors

6.4    **Microprocessors**
- Microprocessor overview
- Types of processors
- Processor modes
- Selecting and upgrading a processor

6.5    **Memory**
- Memory characteristics
- Memory types and packages
- Memory mapping
- Selecting and upgrading memory

6.6    **Disks and drives**
- Disk types
- Disk drives
- Disk organisation
- Disk management

-       Selecting disk drives
-       Maintenance of disks and disk drives

6.7     **Display technology**
-       Display adapters
-       Care and maintenance
-       Performance measures
-       Troubleshooting

6.8     **Computer system assembly and disassembly**
-       Selection and compatibility issues
-       Hardware components installation
-       Computer assembling, disassembling and reassembling
-       Upgrading a computer
-       Electronic waste management

6.9     **Hardware and Software installation**
-       Installation concepts
-       Installing peripheral devices
-       Installing operating systems
-       Installing application programs
-       Installing and upgrading  utility software

6.10    **Fault finding and troubleshooting**
-       Fault finding principles
-       Common equipment faults
-       Hardware and software diagnostics
-       Uninstalling and reinstalling software

6.11    **Computer support**
-       On-line support
-       Help desk  management
-       Safe computer user practices
-       Planning and providing staff training
-       Health and Safety

6.12    **System selection and acquisition**
-       Selection process
-       Analysing requirements
-       Evaluation and testing
-       Equipments costing
-       Warranties
-       Training costs
-       Cost benefits analysis
-       Purchasing
-       Service level agreements
-       Technical checklist

6.13    **Computer security**
-       Virus protection
-       Firewalls
-       Computer backups

6.14    **Emerging issues and trends**

**PAPER NO.7 DATABASE SYSTEMS**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to administer and manage databases

7.0 **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:
- Write structured query language (SQL) statements to manipulate data in databases
- Develop a database application
- Handle transactions and concurrency controls
- Administer databases
- Integrate databases and other applications
- Manage database integrity issues

**CONTENT**

7.1 **Introduction to databases**
- Files, records, files and databases
- History of database systems
- Traditional file systems versus the database approach
- Characteristics, importance and limitations of database systems
- Database components and architecture

7.2 **File organisation techniques**
- Storage structures and blocking
- Unordered files
- Sequential files
- Indexing

7.3 **Database models**

- The role of data modeling
- The hierarchical model
- The relational model
- The object-oriented model
- The object-relational model

7.4 **Database development life cycle**

- Data and user requirements specification
- Stages of database development
- Conceptual, logical and physical database design
- Writing database requirements specifications

7.5 **Relational database model**

- Relational database concepts and properties
- E-R database design
- Database design anomalies
- Normalisation
- Relational algebra
- Creating database design
- Implementing database design in mysql /oracle /DB2

### 7.6 Structured query language (SQL)

- Data definition language
- Data manipulation language
- Structure of SQL statements
- Data control
- In-built functions
- Writing SQL statements
- Using SQL functions

### 7.7 Transaction management and concurrency control

- Transaction management
- Properties of a transaction
- Serialisability and concurrency control
- Lock-based and timestamp-based protocols
- Types of failures
- Database recovery concepts and mechanisms

### 7.8 Database administration

- Database users
- Data administration
- Functions and roles of database administrators
- Monitoring database performance

### 7.9 Database security and integrity

- Security and integrity concepts
- Social, ethical and legal database issues
- Threats to database security and integrity
- Managing threats
- Establishing data backup procedure

### 7.10 Distributed database systems

- Introduction of concepts
- Distribution methods – fragmentation and replication
- Concurrency control mechanisms in distributed systems
- Two-tier database architecture
- Three-tier database architecture

### 7.11 Data warehousing and data mining

- Overview of data warehousing
- Characteristics of a data warehouse
- Components of a data warehouse
- Types of data warehouses
- Elements of a data warehouse
- Over view of data mining
- Techniques of data mining

### 7.12 Integrating databases to other applications

- Importance of integrating databases to other applications
- Integrating databases to other applications (visual basic.net, C++, Java, C# among others)
- Developing web enabled database applications

### 7.13 Emerging issues and trends

**PAPER NO.8 SYSTEMS ANALYSIS AND DESIGN**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her analyse and design information systems

8.0 **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Assess the need for an information system in an organisation

- Use conventional methodologies in systems analysis and design

- Comply with applicable standards in systems analysis and design

- Implement information systems in an organisation

**CONTENT**

8.1 **Introduction to systems analysis and design**

- Systems theory
- Types of information systems
- Role of the systems analyst and user departments
- Systems analysis concepts

8.2 **Systems thinking**

- Hard systems thinking
- Soft systems thinking
- Soft systems methodology
- Hard systems methodology
- Applications of soft and hard systems

8.3 **Systems development life cycle (SDLC)**

- Definition of systems development life cycle
- Phases

8.4 **Structured systems analysis and design methodology (SSADM)**

- SSADM stages
- Strengths and limitations of SSADM
- SSADM Modeling techniques

8.5 **Alternative systems approaches and methods**

- Rapid application development (RAD)
- Joint application development (JAD)
- Object-oriented design methodologies: UML, class, sequence and use case diagrams
- Other system development approaches

8.6 **Systems analysis**

- The need to initiate an information systems project
- Stages and tools in systems analysis
- Fact finding techniques
- Feasibility study
- The analysis report

8.7 **Systems design**

- Logical and physical design
- Systems design approaches
- Writing design specifications

8.8 **Systems analysis and design standards**

- Roles and examples of standards in SAD projects
- Components and development of documentation in a systems project
- Challenges in meeting standards in SAD projects

8.9 **Systems implementation**

- Assessing the platform for the system to be implemented
- Changeover/conversion methods
- Forms of testing
- User training

8.10 **Systems analysis and design environment**

- Security requirements, precautions and procedures in SAD
- Procedures for maintenance of a system
- Integration challenges of system projects with existing systems

8.11 **Emerging issues and trends**

**PAPER NO.9 STRUCTURED PROGRAMMING**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to apply the structured programming approach to develop programs

9.0 **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Analyse a problem and design an appropriate solution
- Write codes using  C programming language
- Test and debug a structured program code
- Produce documentation, both user and technical, to support programs.

**CONTENT**

9.1 **Introduction to structured programming**

- Introduction to programming languages
- Types of programming languages
- Generations of programming languages
- Programming approaches
- Language translators
- Basic concepts of structured programming
- Problem definition, structure and design
- Integrated development environment (IDE)

9.2 **Programming basics**

- Variables and data types
- Input/output statements
- Assignments
- Namespaces
- Comments
- Pre-processor directives
- Expressions and operators
- Control structures
- Writing and running a simple program

9.3 **Functions/sub-programs**

- Functions verses procedures
- Parameter passing
- Recursion
- Calling procedures
- Argument naming
- Event procedures
- Testing and debugging errors
- Writing and running  a program using functions and procedures

9.4    **Data structures**

-    Arrays
-    Pointers
-    Linked lists
-    Unions
-    Writing a program using data structures

9.5    **File handling (Input/Output)**

-    Opening files
-    Writing to files
-    Closing files

9.6    **Application development**

-    Mobile application development
-    Collaborative application development

9.7    **Documentation**

-    User manuals
-    Technical manuals

9.8    **Emerging issues and trends**

**PAPER NO.10 OBJECT ORIENTED PROGRAMMING**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to develop programmes using the object oriented approach

10.0 **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Use variables, conditional statements, looping constructs and methods in an object oriented context

- Analyse a problem and develop an appropriate solution using an object oriented programming language

- Write applications using an object oriented programming language

- Use simple built-in data types such as arrays, strings and some of the collection classes

- Test and debug an object oriented application

- Handle errors in object oriented based programs

**CONTENT**

10.1 **An overview of programming techniques and paradigms**
- Introduction to object oriented programming
- Benefits of object oriented programming over other paradigms

10.2 **Concepts of object oriented programming**
- Definition of objects
- Abstraction
- Information hiding and encapsulation
- Abstract data types
- Methods and messages
- Message relationships
- Classes
- Class inheritance
- Polymorphism
- Aggregation

10.3 **Class implementation**
- Data encapsulation
- Definition of classes
- Member data and functions
- Abstract classes
- Organising codes for classes
- Writing a simple program using classes

10.4 **Functions**
- Function prototypes and type checking
- Conversion of parameters
- Default arguments

- Inline functions
- Function overloading
- Virtual functions and dynamic binding
- Pure virtual functions
- Writing a program using functions

10.5 **Constructors and destructors**

- Constructors and initialisations
- Object creation
- Multiple constructors in a class
- Hidden constructors
- Destructors
- Object destruction
- Virtual destructions
- Writing a program using constructors and destructors

10.6 **Memory management**

- Static, automatic and heap memory
- New and delete operators
- Handling memory allocation errors
- Hiding details of memory management in a class
- Implementing a dynamic string class

10.7 **References and argument passing**

- Call by value
- Reference declarations
- Reference arguments
- Copy constructor
- Constant arguments and functions

10.8 **Scope and access control**

- Variable and function scope
- Friend functions
- Const and enumeration types
- Static members

10.9 **Introduction to inheritance**

- Inheritance for modelling and reuse
- Class derivation
- Access control
- Base class initialisation
- Composition
- Initialising class type members

10.10 **Polymorphism and operators**

- Function overriding
- Operator overloading
- Type casting and conversions
- Pointer conversion

10.11 **Templates**

- Template mechanism
- Function templates
- Class templates
- Generic programming
- Implementing a general array class
- Standard template library
- Writing a program using standard temporary library (STL)

10.12 **Serialised data and objects**

- Streams and files
- Input and output streams
- File streams
- Object streams
- Object serialisation
- Readers and writers
- Writing a program using input/output streams

10.13 **Object oriented application development**

- Mobile application development
- Object relational programming

10.14 **Exception handling and error handling**

- Exception mechanism
- Error handling mechanism
- Exceptions compared to other error handling techniques
- Throw, try and catch
- Exception context and stack unwinding
- Uncaught exceptions
- Automatic cleanup in exception handling

10.15 **Emerging issues and trends**

**PAPER NO.11 WEB DESIGN AND e-COMMERCE**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to design a website, develop e-commerce infrastructure and facilitate e-commerce transactions

11.0 **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Use various web designing tools to design web sites
- Use graphics and animations to enrich web pages
- Create functional sites with hyperlinks, tables, forms and databases
- Use scripts to create dynamic web pages
- Design an e-commerce site and comply with e-commerce regulations
- Implement cloud based solutions

**CONTENT**

11.1 **Introduction to web development**
- Web development concepts
- Introduction to mark-up language
- Overview of HTML
- Basic tags and corresponding attributes

11.2 **Objects, graphics and animations**
- Creating and modifying objects
- Complex objects on a single layer
- Objects on multiple layers
- Using non flash graphics
- Animations with motion and shape tweening
- More complex animation tasks
- Interactivity with frame action and buttons

11.3 **Pictures, effects, images and colouring**
- Incorporating colour techniques
- Placing type in an image
- Understanding layers
- Using layers to refine images
- Creating special effects

11.4 **Web development platforms**

- Paragraphs and layouts
- Working with images, links, tables, forms and URLs
- Using frames
- Layers and positioning
- Behaviour modifications
- Drawing timelines and customising web development tools
- Plug-ins and active content
- Tools for automating web pages
- Setting up a local site
- Managing web sites

11.5 **Scripting**
- Script development
- Incorporating script into HTML
- Basic command syntax/blocks
- Functions and objects
- Built-in objects and functions
- Looping
- Frames, documents and windows
- Database connectivity

11.6 **Animations**
- Animation tools
- Methods of animation

11.7 **Introduction to e-Commerce**

- e-commerce concepts
- Features of e-commerce
- Types/models of e-commerce
- Benefits of e-commerce
- The future of e-commerce

11.8 **e-Commerce infrastructure**
- Telecommunications
- Internet service providers (ISP)
- Website design companies
- Human  resources
- Computing  resources
- Payment gateways
- Security of transactions

11.9 **e-Commerce implementation**
- Size of enterprise
- e-commerce products and services
- e-commerce revenue models/ Financial models
- e-commerce site hosting options
- e-signatures
- e-procurement

11.10 **Electronic transaction law**
- Internet applications
- e-commerce and e-marketing approach
- Digital technology
- e-signature
- Third parties
- Approval of e-contract

11.11 **Cloud computing**
- Overview of cloud computing
- Infrastructure as a service (IaaS)
- Platform as a service (PaaS)
- Software as a service (SaaS)
- Business process as a service (BPaaS)
- Cloud security
- Enterprise cloud based high performance Computing (HPC) applications

11.12 **Emerging issues and trends**

**PAPER NO. 12 DATA COMMUNICATION AND COMPUTER NETWORKS - PRACTICAL**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to manage data communication and computer networks

12.0 **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Use data communication and computer networking devices
- Setup, configure and test a LAN
- Implement security and audit policies in a networking environment
- Backup and restore network data
- Monitor and troubleshoot a network
- Design internet of things (IoT) – based applications

**CONTENT**

12.1 **Data communication concepts**

- Overview of data communication concepts
- Data terminology
- Data transmission technologies
- Communication models
- Types of networks
- Network topologies

12.2 **Networking components**

- Hardware
- Software
- Media
- Server/Clients
- Wireless media

12.3 **Data signal analysis**

- Overview of data signal analysis
- Analogue and digital signals
- Modulation and demodulation
- Transmission modes
- Data and line encoding
- Viewing data signal characteristics using oscilloscope, spectrum analyser and level tracers
- Sampling ASCII and EBCDIC coding techniques using binary and hexadecimal mathematics
- Nyquist Shannon theory

## 12.4 Setting up a LAN

- Preparation of networking cables
- Testing connectivity
- Connecting LAN to the Internet
- Configuring TCP/IP and other protocols
- Setting up static and dynamic addressing
- Configuring TCP/IP and other protocols utilities
- Testing TCP/IP and other protocols configurations
- Configuring a domain name service (DNS)

## 12.5 Administering user accounts

- Local user accounts
- Domain user accounts
- Built in user accounts

## 12.6 Configuring network printers and other resources

- Adding and sharing a local printer
- Adding and sharing a network printer
- Downloading printer drivers
- Setting up a printer pool
- Setting up priorities between printers
- Administering network printers
- Managing other network resources; Files, Ports, Drives

## 12.7 Implementing security and audit policies

- Setting up security controls
- Configuring password policy
- Configuring account lock out policy
- Planning for audit policy
- Using audit policy
- Using event viewer
- Auditing access to files and folders
- Auditing access to printers and other network resources

## 12.8 Data backup and restoration

- Planning backup
- Backing up data
- Restoring data

## 12.9 Monitoring network resources

- Monitoring access to network resources
- Monitoring communication among network devices
- Monitoring utilisation of network resources
- Monitoring network users

## 12.10 Network troubleshooting

- Identifying network faults
- Physical methods of troubleshooting
- Using software tools to troubleshoot
- Fixing network faults

## 12.11 Internet of things (IoT)

- Overview of IoT
- Elements of IoT
- Radio-frequency identification (RFID)
- Sensor and sensor network
- Localization
- Business ecosystem, scenarios and model
- IoT application areas and solutions

## 12.12 Emerging issues and trends

**PAPER NO. 13 STRATEGY, GOVERNANCE AND ETHICS**

This paper is intended to equip the candidate with knowledge, skills and attitudes that will enable him/her to formulate and implement strategies and demonstrate good governance and ethical practices

13.0 **LEARNING OUTCOMES**
A candidate who passes this paper should be able to:
- Analyse the environment and its impact on strategic decision making
- Formulate and implement a strategic plan
- Practice the tenets and principles of good governance
- Comply with ethical principles in an organisation

**CONTENT**
13.1 **Overview of management**
- Importance of management
- Principles of management
- Management as a science, an art or a profession
- Functions and roles of management
- Levels of management and managerial skills
- Management and administration

13.2 **Development of management thought**

- Pre-industrial revolution management theories
- Classical theories, neo-classical theories
- Contemporary theories

13.3 **Overview of management functions**
- Planning
- Organising
- Staffing
- Directing
- Controlling

13.4 **Overview of corporate strategy and governance**
- Meaning of strategy, management and strategic management
- Scope of strategic management
- Levels of strategic management
- Benefits of strategic management
- Limitations of strategic management
- Strategic management process
- Meaning and importance of governance
- Principles of corporate governance
- Best practice in corporate governance
- Codes of corporate practices and conduct in public and private sectors
- Corporate Governance theories

**13.5 Environmental analysis**
- Purpose of environmental analysis
- Internal environment analysis
- External environment analysis

**13.6 Strategy formulation**
- Organisational vision and mission
- Organisational goals and objectives
- Development of corporate strategy and business strategy
- Strategic options
- Strategy formulation constraints
- Competitive advantage

**13.7 Strategy implementation**
- Organisation structure
- Resource allocation
- Organisational culture
- Role of leadership on strategy implementation
- Innovation and knowledge management
- Constraints to strategy implementation

**13.8 Strategic monitoring and evaluation**
- Purpose and role of strategic monitoring and evaluation
- Process of strategic monitoring and evaluation
- Tools of strategic monitoring and evaluation
- Role of management information systems
- Performance measurement; balance scorecard and benchmarking
- Features of good strategic monitoring and evaluation systems
- Review and feedback
- Continuous improvement

**13.9 Management of Strategic change**

- Strategic leadership
- Implementing change
- Managing organisation power and politics
- Business excellence model
- Learning organisation
- Lean and quality management

**13.10 Promoting good corporate governance**
- Rights of shareholders and responsibilities to stakeholders
- The chairman, board of directors and management
- The secretary
- Duties and responsibilities of auditors
- Investor education
- Internal and external corporate governance controls

### 13.11 Composition, appointment and duties of directors
- Mix of skills and competencies of directors
- Executive and non-executive directors
- Qualification, appointment, removal, retirement and reappointment
- Director's remuneration
- Directors training and development
- Directors' liabilities and insurance indemnity
- Framework for performance evaluation of the board of directors
- Statutory and fiduciary duties of directors
- Directors as agents of shareholders
- Matters reserved to the board of directors
- Conflict of interest and disclosure
- Code of good boardroom practice

### 13.12 Enterprise Risk Management (ERM)
- The ERM Framework: Risk management philosophy, risk appetite, control
- Categories of risk
- Managing risk: financial and operational; risk management process
- Role of the Board in ERM
- Risk responses: avoidance, acceptance, reduction and sharing

### 13.13 Professional values and ethical principles

- Professional judgment
- Confidentiality
- Ethics: definition, theories and principles on ethics
- Ethical norms, morality and values
- Code of ethics
- Standards of conduct and personal integrity
- Ethics in business
- Corporate Social responsibility

### 13.14 Conflict of interest and insider trading

- Conflict of interest and market manipulation
- Disclosure of interest
- Communication of the conflict of interest
- Insider trading
- Whistle blowing
- Conflict of interest register
- Dispute resolution mechanism

### 13.15 Case studies in strategy, governance and ethics

### 13.16 Emerging issues and trends

**PAPER NO.14 SOFTWARE ENGINEERING**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to implement and manage a software engineering approach in an organisation

14.0 **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Identify appropriate software system design tools

- Design appropriate software systems

- Describe software system testing

- Document and commission a software

- Evaluate software acquisition techniques

- Maintain a software

**CONTENT**

14.1 **Introduction to software systems development**

- Software systems development concepts
- Software development life cycle

14.2 **Software process models**

- Linear/ waterfall model
- Rapid prototyping
- Evolutionary models
- Component based models
- Other models

14.3 **Software requirements analysis**

- Overview of requirements concepts
- Requirement analysis process
- Requirements specification

14.4 **Design tools and methods**

- System flowcharts
- Case tools
- Functional decomposition
- Modules design
- Structured walkthrough
- Decision tables
- Structured charts
- Data flow diagrams
- Object oriented design tools

14.5 **Software quality**

- Quality control and assurance
- Software quality factors and metrics
- Formal technical reviews

-   Verification and validation
-   Cost of quality

## 14.6 Software coding

-   Coding styles and characteristics
-   Coding in high-level languages
-   Coding standards
-   User interface

## 14.7 Software testing
-   Software testing life cycle
-   Software testing methods (Black box testing and White box testing)
-   Software testing levels (unit, integration, system and acceptance testing)
-   Other forms of testing

## 14.8 Software acquisition methods
-   Software  costing
-   Software outsourcing
-   Open-source software engineering and customisation
-   In-house development
-   Commercial Off The Shelf software (COTS)
-   Budgeting for information systems
    -   Financial cost benefit analysis
    -   Business case approach
    -   Total cost of ownership
    -   Balanced scorecard/activity based costing and expected value
    -   Tracking and allocating costs

## 14.9 Conversion strategies
-   Conversion planning
-   Parallel running
-   Direct cut over
-   Pilot study
-   Phased approach

## 14.10 Documentation and commissioning

-   Objectives of systems documentation
-   Use of systems documentation
-   Qualities of a good documentation
-   Types of documentation
-   Software commissioning

## 14.11 Software maintenance and evolution
-   Types of software changes
-   Software change identification
-   Software change implementation

## 14.12 Auditing information systems

-   Overview of information systems audit
-   Auditing computer resources
-   Audit techniques
-   Audit applications

## 14.13 Emerging issues and trends

**PAPER NO.15 MOBILE APPLICATION DEVELOPMENT**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to develop and upgrade mobile applications

**15.0  LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Identify mobile applications, platforms and architecture

- Develop mobile applications using development tools and strategies

- Test mobile applications
- Secure mobile applications

**CONTENT**

**15.1  Mobile devices and applications**

- Definition of mobile computing
- Types of mobile devices
- Uses of mobile devices
- Overview of mobile applications
- Mobile browsers

**15.2  Introduction to mobile application development**

- Mobile application challenges
- Mobile application development tools
- Mobile application programming languages
- Mobile application management
- Mobile application best practices

**15.3  Mobile platforms and architectures**

- Internet protocols for mobile applications
- Mobile application distribution platforms and environments
- Mobile application development architectures
- Styles of mobile architecture

**15.4  Mobile application development**

- Mobile application development lifecycle
- Functions, arrays and objects
- Control structures and modes of execution
- Using HTML, CSS, DOM, Javasript and JQuery

**15.5  iOS application development**

- Window-based application and MUC
- Objective-C programming
- User Interface Design
- Introduction to graphics on the iPhone
- Core data and localisation
- Multi-threading and multi-tasking

- Web services and networking

15.6 **Android application development**

- Java reviews
- Androids SPK
- Resources, views and intents
- Intents and storage
- Storage and threads

15.7 **Mobile application testing**

- Merits and demerits of mobile application testing
- Challenges of mobile application testing
- Types of mobile application testing
- Testing tools

15.8 **Mobile application security**

- Reducing mobile risks
- Cloud based assessments and solutions
- Security strategies
- Security testing techniques and certification

15.9 **Emerging issues and trends**

**SECTION 6**

**PAPER NO.16 SYSTEMS SECURITY**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to secure ICT systems in an organisation

16.0 **LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Identify types of threats to ICT systems
- Adopt different security mechanisms
- Prepare business continuity planning (BCP) strategies
- Develop and implement a systems security policy
- Undertake basic computer forensic audits
- Demonstrate social-ethical and professional values in computing.

**CONTENT**

16.1 **Introduction to systems security**

- Overview of systems security
- Goals of system security
- Security core concepts
- Security mechanisms

16.2 **Security threats and controls**

- Sources of threats
- Types of threats
- Crimes against ICT and computer criminals
- Controlling security threats
- Ethical hacking

16.3 **Systems security**

- Classification
- People errors
- Procedural errors
- Software errors
- Electromechanical problems
- Dirty data

16.4 **Physical and logical security**

- Physical security
- Logical security(authentication, access rights, others)

16.5 **Data/software security**

- Use of the normal security systems
- Vulnerability assessment
- Employing virus security precautions
- Employing Internet security precautions
- Vetting of ICT employees

16.6 **Transmission security**
- Symmetric encryption
- Asymmetric encryption
- Duplicate and alternate routing
- Firewall types and configuration
- Secure socket layer and transport layer security
- IPv4 and IPv6 security
- Wireless network security
- Mobile device security
- Wireless protected access

16.7 **ICT risk management**
- Risk management concepts
- Risk analysis
- Risk assessment  framework
- Countermeasures
- Corporate risk document

16.8 **Business continuity planning (BCP)**
- BCP scope, teams and roles
- Backup types  and strategies
- Hot and cold sites
- Disaster recovery plans

16.9 **System security policy implementation**
- Components of systems security policy
- Systems security policy development
- System security policy implementation
- Systems security strategies
- Audit

16.10 **Introduction to computer forensics**
- Computer forensics concepts
- Incidence handling
- Investigating desktop incidents
- Investigating network incidents
- Securing and preserving evidence

16.11 **Professional values and ethics in computing**
- Intellectual property and fraud
- Information systems ethical and social concerns
- Telecommuting and ethical issues of the worker
- Codes of ethics for IT professionals
- Professional ethics and values on the web and Internet
- Objectivity and integrity in computing
- The role of professional societies in enforcing professional standards in computing

16.12 **Emerging issues and trends**

**PAPER NO. 17  INFORMATION SYSTEMS PROJECT MANAGEMENT**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to manage information systems projects

**17.0  LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Manage project scope using various techniques
- Use information system project management software
- Implement information systems projects
- Monitor and control project risk
- Prepare project schedules using project management software tools
- Manage information systems project procurement process

**CONTENT**

**17.1  Overview of an information systems project**
- Definition of a project
- Project management principles
- Purpose of project management
- Project roles and responsibilities
- Information system project environment
- Characteristics of project
- Examples of information system projects

**17.2  Information systems project lifecycle**
- Project identification
- Feasibility study
- Project selection
- Project objectives
- Project proposal
- Project design
- Project development
- Project implementation
- Project monitoring
- Project review

**17.3  Project scope management**
- Scope definition
- Scope verification
- Scope control
- Using a software tool to assist in project scope management

**17.4  Project planning**
- Determining project tasks
- Work breakdown structures
- Milestones schedules
- Task dependencies and relationships
- Planning time scales
- Materials and equipment management
- Tools and techniques of project planning and scheduling
- Using a software tool to assist in project planning

17.5    **IS  project resource management**
-       Information system project resources
-       Resource planning
-       Resource allocation framework
-       Information resource portfolio management
-       Resource schedules
-       Cost management
-       Determining project tasks
-       Work breakdown structures
-       Task dependencies and relationships
-       Materials and equipment management
-       Tools and techniques of project planning and scheduling
-       Using software tools to assist in resource management

17.6    **IS project  organisational structures**
-       Organisational structures
-       Integrating project work and project organisational structures
-       Team management
-       Project team life cycle
-       Change management
-       IS project quality management
-       Quality management
-       Quality planning
-       Quality assurance
-       Quality control
-       Tools and techniques for quality control
-       Project quality factors
-       Overview of project management standards (PRINCE 2)
-       Software tools in project quality management
-       ISO certification
-       Using a software tool  to assist in quality management

17.7    **IS project communication management**
-       Communication management
-       Essentials of project documentation
-       Progress reporting
-       Report writing
-       Managing stakeholders
-       Using a software tool to assist in project communication management

17.8    **IS project risk management**
-       Risk identification process
-       Common sources of risk
-       Risk management tools and techniques
-       Risk analysis
-       Risk monitoring and control
-       Using a software tool in risk management

17.9    **IS project procurement management**
-       The procurement planning process, tools and methods
-       Request for proposal and quotations
-       Evaluation of proposals and quotations
-       Contracting and contract administration
-       Using a software tool in project procurement management

### 17.10 IS project implementation, completion and evaluation

- Managing transition
- Project evaluation
- Team evaluation
- Using a software tool to enhance project evaluation

### 17.11 Emerging issues and trends

**PAPER NO. 18 RESEARCH METHODS**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to design and carry out research on information systems

### 18.0    LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Identify and analyse problems for which research is required
- Identify the major types of research designs
- Formulate clearly defined research objectives and research questions
- Analyse key issues and themes from existing literature
- Conduct research
- Present research findings
- Apply ethics in research

### CONTENT

18.1    **Introduction to research**
- Meaning of research
- Types of research
- Significance of research
- The research process
- Challenges in carrying out research
- Types of research designs
- Format of research project
- Research methodology

18.2    **The research problem**
- Problem identification
- Salient features of a good problem statement
- Background and context of the problem
- Problem statement
- Research  objectives: General and specific objectives
- Research questions
- Research hypothesis/formulation of hypothesis
- Development of theoretical/conceptual framework

18.3    **Literature review**
- Meaning and importance of literature review
- Theoretical review and Empirical review
- Critical review of major issues
- Theoretical and conceptual framework

18.4    **Research methodology**
- Target population
- Sampling techniques and sample size
- Data collection
- Data collection method
- Reliability and validity of data

**18.5    Analysis and presentation of findings**
-         Analysis  of findings
-         Presentation of findings
-         Testing of  hypothesis
-         Summary, conclusions and recommendations

**18.6    Format of research project**
-         Preliminaries
-         Content chapters
-         Referencing – APA format
-         Appendices

**18.7    Issues in research**
-         Ethical considerations in research
-         Implementation of research recommendations

**18.8  Emerging issues and trends**

## ICT PROJECT

The ICT Project will be undertaken by a candidate after completing Paper Nos. 1 to 18 of the CICT examination.

## GENERAL OBJECTIVE

To prepare a candidate to apply research, analytical and practical skills in solving real life information systems problems, using information communication and technology tools.

## LEARNING OUTCOMES

A candidate who successfully completes the ICT project should be able to:

- Carry out independent research on a specific problem
- Identify real life information system problems
- Analyse the identified problem
- Design  a software solution to the identified problem
- Use appropriate software tools to develop and test the proposed solution
- Produce complete documentation for the developed system
- Demonstrate effective communication and presentation skills

**Note:** Candidates are advised to obtain the "**ICT Project Guidelines**" from the offices of KASNEB or download the guidelines from the KASNEB website (www.kasneb.or.ke**)**