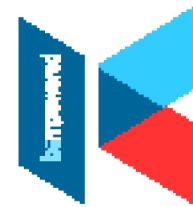


Certified Information
Communication Technologists



kasneb

CICT



**EXAMINATION
SYLLABUS**

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

Part I

Section 1

Paper No. 1	Introduction to Computing
Paper No. 2	Computer Applications - Practical
Paper No. 3	Entrepreneurship and Communication

Section 2

Paper No. 4	Operating Systems - Practical
Paper No. 5	Principles of Accounting
Paper No. 6	Computer Support and Maintenance

Part II

Section 3

Paper No. 7	Database systems
Paper No. 8	Systems Analysis and Design
Paper No. 9	Structured Programming

Section 4

Paper No. 10	Object Oriented Programming
Paper No. 11	Web Design and e-Commerce
Paper No. 12	Data Communication and Computer Networks - Practical

Part III

Section 5

Paper No. 13	Strategy, Governance and Ethics
Paper No. 14	Software Engineering
Paper No. 15	Mobile Application Development

Section 6

Paper No. 16	Systems Security
Paper No. 17	Information Systems Project Management
Paper No. 18	Research Methods

ICT Project

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ICT Project

PART I
SECTION 1

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**

SECTION 2

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**

PART II SECTION 3

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**

SECTION 4

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 destructors
- 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

**PART III
SECTION 5**

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, Javascript 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)