Certified Information Communication Technologists (CICT)

Examination Syllabus

Advance Copy - July 2018
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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 attitudes 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 organisation
- Control information systems threats.

CONTENT

1.1 Introduction to information communication technology (ICT)
- Components of a computer system
- Classification of computers
- Evolution of computers
- Computer peripherals and interfaces
- Application areas of computer systems
- Impact of ICT in society
- Careers in ICT

1.2 Computer hardware
- Input devices
- Processing devices
- Memory
- Storage devices
- Output devices
- Communication devices
- Selection of computer hardware

1.3 Computer software
- Classification of computer software
- Systems software
- Application software
- User interface
- Selection and acquisition of computer software

1.4 Computer start up/booting
- Types of power supply
- Power supply unit
- Power protection
- Booting process
- BIOS setup
1.5 **Keyboard and mouse skills**
- Types of keyboards
- Keyboard layout
- Typing skills
- Keyboard ergonomics
- Mouse skills

1.6 **Software installation**
- Installation procedures
- Operating system installation
- Application software installation
- Types of installations
- Installers
- Configuration
- Uninstalling software

1.7 **Number systems, computer arithmetic and set theory**
- Computer codes (BCD, ASCII, UNICODE and EBCDIC)
- Zoned decimal and packed decimal formats
- Number systems
- Number systems conversions and compliments
- Binary arithmetic
- Sets and set theory
- Error codes

1.8 **Data processing cycle**
- Introduction to data processing
- Stages in 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
- Data security

1.9 **Logic, truth tables and circuits**
- Statements
- Conjunction
- Disjunction
- Negation
- Propositions 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 and NOT 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
- Hardware troubleshooting tools
- Software errors
- Software troubleshooting techniques
- Software troubleshooting tools

1.12 **Emerging issues and trends**
GENERAL OBJECTIVE

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to use computer applications.

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 computer operations
- Introduction to operating systems and application programs
- Starting up the computer
- Managing files and folders
- Plugging in, preparing and ejecting storage devices
- Loading applications

2.2 Peripheral devices
- Types of keyboards
- Keyboard layouts
- Keyboard ergonomics
- Touch screen
- Adding / removing printer
- Setting up default printer
- Projectors

2.3 Word processing software
- Using features of a word processor window
- 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
- Inserting footnote, endnotes, citation and bibliography
- Proofreading tools
- 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
- Using templates
- Automating simple tasks
- Printing a document

2.4 **Spreadsheet software**
- Using features of a spreadsheet window
- Creating, saving and retrieving existing workbook
- Cell editing and navigation
- Freezing and unfreezing pane
- 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
- Protecting and sharing workbooks
- Printing worksheets

2.5 **Presentation software**
- Using features of a presentation program window
- 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

2.6 **Database software**
- Overview of databases
- Using features of a database window
- Creating, saving and retrieving existing database
- Identifying tables, fields, data types and records
- Establishing relationships between tables
- Creating forms and queries
- 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

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

2.8 **Emerging issues and trends**
PAPER NO.3 ENTREPRENEURSHIP AND COMMUNICATION

GENERAL OBJECTIVE

This paper intends to equip the candidate with knowledge, skills and attitudes that will enable him/her to apply entrepreneurship knowledge in business and other environments.

3.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:
- Identify viable business opportunities
- Prepare a business plan
- Demonstrate entrepreneurial orientation skills
- Communicate effectively in a business environment
- Apply entrepreneurial knowledge in response to the emerging business trends.

CONTENT

3.1 Entrepreneurial mindset
- Definition of entrepreneurship
- Historical development of entrepreneurship
- Characteristics of entrepreneurs
- Types of entrepreneurs
- Distinction between entrepreneurs and small business owners
- Approaches to entrepreneurship
- Importance of entrepreneurs to development

3.2 Entrepreneurship and innovation
- Creativity and innovation
- Corporate entrepreneurship and innovation
- Qualities of entrepreneurial firms
- Social enterprises and sustainability
- Entrepreneurial ethics, responsibility and leadership
- Case study on corporate entrepreneurship

3.3 Opportunity identification and development
- Methods of generating ideas
- Sources of innovative ideas
- Qualities of viable business opportunities
- Evaluating business opportunities
- Challenges of starting new ventures
- Why new ventures fail
- Business incubation
- Role of government in promoting entrepreneurship

3.4 Creating and starting a new venture
- Approaches to creating new ventures
- Acquiring an established business venture
- Business planning
- Overview of the business plan
- Scope and value of a business plan
- Practical experience in writing of a business plan
3.5 **Business growth strategies**
- Penetration, market and product development strategy
- Public and private placements
- Joint ventures
- Diversification
- Loans and equity financing
- Venture capitalists
- Informal risk capitalists
- Crowd funding and crowding sourcing

3.6 **Entrepreneurship and technology**
- Internet and e-commerce
- The enterprise website
- Impact of globalisation
- Global entrepreneurs
- Business process outsourcing
- Electronic and mobile money transfers
- Business networking

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
- Role of participants
- Conduct of meetings
- Minutes of meetings

3.11 **Information technology and communication**
- The internet
- Teleconferencing
- Wireless technologies
- Electronic postal services
- Use of E-mails

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 attitudes that will enable him/her to administer operating systems.

4.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:

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

CONTENT

4.1 Introduction to operating systems
- Definition of an operating system
- History of operating systems
- Types of operating systems
- User Interfaces
- Functions of operating systems
- System calls
- Operating system structures
- Selecting an operating system

4.2 Installing an operating system
- Installation procedure
  - Pre installation tasks
  - Installation tasks
  - Installation methods
  - Installation process
- Uninstalling operating systems
- Reinstalling operating systems
- Upgrading operating systems
- Multibooting
- Troubleshooting operating systems

4.3 Processes and threads
- Processes
- Threads
- Inter-process communication
- Classical IPC problems
- Scheduling
- Overview of 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
- Overview of workgroups and domains
- Workgroups
- Joining a workgroup
- Domains
- Joining a domain
- Creating user accounts

4.6 Using management console and scheduler
- Overview of management consoles
- Snap-ins
- Using consoles
- Using schedulers

4.7 Control panel
- Overview of control panels
- Accessing control panel items
- Changing the settings of the control panel items

4.8 Configuring hardware settings
- Viewing hardware profiles
- Creating or modifying hardware profiles
- Activating and deactivating hardware profiles
- 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
- Error reporting
- Updates
- Troubleshooting operating systems

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
- Analysing 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
- Overview of file systems
- Creating files and directories
- Mounting drives on different file systems
- Sharing files and folders
- Securing files and folders
- Securing resources using NTFS permissions

4.14 Emerging issues and trends
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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 and interpret financial statements for different entities.

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.

CONTENT

5.1 Introduction to Accounting
- The nature and purpose of accounting
- Users of accounting information and their respective needs
- Accounting Standards and their purposes
- Regulatory framework (ICPAK, IASB, IAESB, IPSASB)
- Professional ethics
- Principles; concepts and conventions underlying the preparation of accounting statements

5.2 Accounting procedures and techniques
- Double entry book-keeping
- The cash book; two and three column including cash journal
- The ledger and their role in recording and summarising, classifying accounting data
- Books of original entry
- Petty cash book
- Balancing accounts and preparing the trial balance
- Introduction to simple statements of financial performance
- Statements of financial position

5.2.1 Computerised accounting
- Different accounting packages
- Rationale for computerised accounting system
- Components of a computerised accounting system
- Selecting a good computerised accounting system
- Challenges of a computerised accounting system
- Current trends in computerised accounting software

5.3 Preparation of financial statements and year-end adjustments
- Depreciation of non-current assets including their disposal (by part exchange; ordinary sale; accident)
- Methods and reasons of providing for depreciation
- Preparation of movement of property, plant equipment (as per International Financial Reporting Standards)
- Trade receivables, bad debts write-offs and provision for bad and doubtful debts
- Accruals, prepayments, reserves and provisions
- Necessary adjustments in statements of financial performance to record increase and decrease in provision for bad and doubtful debts

5.4 **Confirming and correcting mechanism**
- Bank reconciliation statements
- Control accounts

5.5 **Errors and correction of errors**
- Errors affecting and not affecting the agreement of the trial balance
- Use of the suspense accounts
- The effect of errors on statement of financial performance and statement of financial position

5.6 **Sole traders accounts**
- Income statements
- Statements of financial position

5.7 **Partnership accounts**
- Basic contents of a partnership agreement
- Provisions of the Partnership Act
- Partnership statement of financial performance and appropriation account
- Partners current account and statement of financial position
- Financial statements to reflect elementary changes in partnership such as admission, retirement and dissolution

5.8 **Introduction to simple company accounts**
- Share capital and reserve
- Issue of shares at par; premium; discount
- Over and under subscriptions
- Allotment and calls on shares, forfeiture of shares
- Preparation of statements of financial performance and appropriation account and the statement of financial position
- Published accounts: Components of a complete set of published financial statements only

5.9 **Manufacturing accounts**
- Elements of cost and cost behaviour
- Preparation of manufacturing accounts, statement of financial performance and statement of financial position
- Accounting treatment of manufacturing profit or loss and unrealised profit on closing stock

5.10 **Financial statements of a not-for-profit organisation**
- What non-profit making organisations are
- Receipts and payments accounts
- Income and expenditure accounts and statement of financial position

5.11 **Incomplete records and single entry book keeping**
- Why incomplete records
- Preparation of statement of affairs
- Preparation of financial statements
5.12 **Analysis of financial statements**  
**Introduction to accounting ratios**  
- Profitability ratios  
- Revenue ratios  
- Liquidity ratios  

**Preparation of cash flow statements (International Accounting Standard 7)**

5.13 **Public sector accounting**  
- Features of public sector entities (as compared to private sector)  
- Structure of the public sector and examples of entities in public sector  
- Objectives of public sector financial statements  
- Users of public sector financial statements and officers (treasury, accounting officers, public accounts committee, auditor general)  
- IPSAS on inventory, property, plant and equipment and intangible assets (the ledger accounts of central and county governments are not examinable)  
- Accounting techniques in public sector (budgeting, cash, accrual, commitment and fund)

5.14 **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 attitudes that will enable him/her support and maintain computers.

6.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Maintain computer hardware components and software
- Identify and apply the tools and equipment associated with computer support and maintenance
- Install and uninstall operating systems and application programs
- Troubleshoot computer hardware and software
- Disassemble and reassemble computer systems
- Identify and replace faulty components
- Undertake effective selection and acquisition of computer systems
- Back-up data and information

CONTENT

6.1 Introduction to computer support and maintenance
- Computer electronic components
- The physics of electronics
- The use of maintenance tools and equipment
- Standard operating and maintenance procedures
- Safety precautions

6.2 Power supply
- Overview of power supply
- Power supply protection devices
- Power supply sources
- Power supply protection devices
- Using power supply devices
- Power supply problems and trouble shooting

6.3 Motherboards
- Computer cases
- Types of motherboards
- Motherboard components
- Installing Motherboard
- 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
- BIOS Set up
- Selecting and upgrading memory

6.6 **Disks and drives**
- Types of storage
- Disk types
- Disk drives
- Disk organisation
- Disk management
- Techniques and tools for disk management
- Selecting disk drives
- Maintenance of disks and disk drives

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

6.8 **Computer system assembly and disassembly**
- Selection and compatibility issues
- Assembly, disassembling and reassembling
- Personal computers
- Portable and mobile devices
- Printers
- Upgrading computers
- Electronic waste management

6.9 **Hardware and software installation**
- Installation concepts
- Installing hardware components
- Installing peripheral devices
- Installing operating systems
- Installing application programs
- Installing utility software
- Upgrading utility software

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

6.11 **Computer support**
- On-line support
- Help desk management
- Planning and providing staff training
- Health and safety

6.12 **Computer system selection and acquisition**
- Selection and procurement process
- Analysing requirements
- Evaluation and testing
- Cost benefit analysis
- Equipments costing
- Training costs
- Warranties
- Service level agreements
- Technical Checklist
- Purchasing

6.13 **Computer security**
- Level of computer security
- Data protection
- Back up and restoration procedure.
- Overview of data recovery

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 attitudes that will enable him/her to design, develop, administer and manage databases.

7.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Create databases to solve business problems
- Write structured query language (SQL) statements to manipulate data in databases
- Handle transactions and concurrency controls
- Administer databases
- Integrate databases and other applications
- Manage database integrity issues.

CONTENT

7.1 Introduction to databases
- Overview of 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
- Structured and unstructured data
- Unordered files
- Sequential files
- Indexing

7.3 Database models
- The role of data modelling
- The hierarchical model
- The network model
- The relational model
- The object-oriented model
- The object-relational model
- Database model selection criteria

7.4 Database development life cycle
- Data and user requirements
- Specification of database requirements
- Stages of database development
- Conceptual, logical and physical database design
- Testing the database functionality
7.5 **Relational database model**
- Relational database concepts and properties
- E-R database design
- Database design anomalies
- Normalisation and denormalisation
- Relational algebra
- Creating database design
- Implementing database design

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
- Optimising SQL queries

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

7.8 **Database administration**
- Overview of database administration
- Types of database users
- Functions and roles of database administrators
- Monitoring database performance
- Database tuning

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 and restore procedures

7.10 **Distributed database systems**
- Overview of distributed database systems
- 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
- Overview of data mining
- Tools and techniques of data mining

7.12 Integrating databases with other applications
- Importance of integrating databases with other applications
- Integrating databases with other applications
- Basics of 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 attitudes 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
- Apply the activities of the system analyst and systems designer
- Identify the applicable standards in systems analysis and design
- Implement information systems

CONTENT

8.1 Introduction to systems analysis and design
- Elements of information systems
- Systems theory
- Types of information systems
- Personnel involved in systems analysis and design
- Systems analysis and design concepts

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

8.3 Systems development life cycle (SDLC)
- Definition of systems development life cycle
- Phases of SDLC
- Advantages and disadvantages of SDLC

8.4 Requirements elicitation
- Stakeholder analysis
- Need for requirements gathering
- Process for requirements gathering
- Requirements gathering tools and techniques
- Gap analysis
- Prioritisation of requirements

8.5 Systems analysis
- Information systems project initiation
- Feasibility and risk analysis
- Stages in system analysis
- Tools and techniques in system analysis
- System analysis report
- Using software tool to assist in systems analysis

8.6 Systems design
- System design approaches
- Logical and physical design
- Modelling techniques
- User interface design
- Case tools
- Designing test cases
- Writing and documenting design specification
- Using software tools to assist in systems design

8.7 **SAD approaches and methodologies**
- Structured system analysis and design methodology (SSADM)
- Object-oriented design methodologies
- Rapid application development (RAD)
- Joint application development (JAD)
- Alternative software analysis and design approaches
- Strengths and limitations of the approaches and methodologies

8.8 **Systems implementation**
- Assessing the platform for the system to be implemented
- User training
- Data conversion methods
- System changeover

8.9 **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

8.10 **Systems analysis and design environment**
- Security requirements, precautions and procedures in SAD
- System maintenance
- Integration problems

8.11 **Emerging issues and trends**
GENERAL OBJECTIVE

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

9.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:
- Analyse a problem and design an appropriate programming solution
- Write programs using C programming language
- Test and debug structured programs
- Produce documentation, both user and technical, to support programs.

CONTENT

9.1 Introduction to structured programming
- Overview of programming
- Types of programming languages
- Generations of programming languages
- Programming approaches
- Program 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
- Identifiers
- Namespaces
- Comments
- Program formatting
- Pre-processor directives
- Expressions and operators
- Control structures
- Writing simple programs
- Testing and debugging

9.3 Functions/sub-programs
- Functions versus procedures
- Function declaration
- Function definition
- Recursion
- Function calls
- Arguments and parameters
- Parameter passing
- Writing and running a program using functions

9.4 Data structures
- Overview of data structures
- Arrays
- Structures
- Pointers
- Linked lists
- Writing programs using data structures

9.5 **File handling (input/output)**
- Overview of files
- Opening files
- Writing to files
- Reading from files
- Closing files

9.6 **Application development**
- Overview of mobile application development
- Collaborative application development

9.7 **Documentation**
- Developing user manuals
- Developing 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 attitudes that will enable him/her to develop object oriented programs using Java.

10.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Analyse a problem and develop an appropriate solution using the object oriented programming language
- Write programs using the object oriented programming language
- Test and debug object oriented programs
- Handle errors in object oriented programs

CONTENT

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

10.2 Introduction to Java programming language
- Java language specification
- Java JDK, IDE and API
- Identifiers, data types and variables

10.3 Concepts of object oriented programming
- Methods and messages
- Abstract data types
- Classes
- Objects
- Class relationships
- Encapsulation
- Abstraction
- Inheritance
- Polymorphism
- Interfaces

10.4 Functions/methods
- Function declaration
- Function prototype and type checking
- Arguments and parameters
- Inline functions
- Function overloading
- Pure virtual functions
- Reference and argument passing
- Writing programs using functions

10.5 Class implementation
- Overview of classes
- Member data and functions
- Data encapsulation
- Abstract classes and interfaces
- Organising codes for classes
- Writing simple programs using classes

10.6 **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

10.7 **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

10.8 **Scope and access control**
- Variable and function scope
- Friend functions
- Constant 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 and generics**
- Template mechanism
- Function templates
- Class templates
- Generic programming
- Implementing a general array class
- Standard template library
- Writing programs 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 programs using input/output streams

10.13 **Object oriented application development**
- Introduction to mobile application development
- Overview of object relational programming

10.14 **Exception handling and error handling**
- Overview of errors and exceptions
- Exception mechanism
- Error handling mechanism
- Exceptions compared to other error handling techniques
- Throw, try, catch and finally
- Exception context and stack unwinding
- Custom exceptions
- Uncaught exceptions
- Automatic cleanup in exception handling

10.15 **Emerging issues and trends**
PAPER NO.11 WEB DEVELOPMENT AND e-COMMERCE

GENERAL OBJECTIVE

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to develop a web application and implement e-commerce.

11.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:
- Use contemporary website development tools and techniques
- Use graphics and animations to enrich websites
- Create functional websites incorporating various HTML components
- Create dynamic websites
- Design and develop an e-commerce website and comply with e-commerce regulations
- Implement cloud based solutions
- Implement various risk and security strategies in web applications.

CONTENT

11.1 Introduction to web application development
- Web application development concepts
- Web application design principles
- Overview of web application development languages
- Introduction to mark-up language
- Phases of web application development process
- Mobile web applications

11.2 HTML
- Basic structure of HTML
- Basic tags and corresponding attributes
- HTML elements
- HTML coding
  - Text
  - Links
  - Lists
  - Images
  - Tables
  - Forms
  - Frames
  - URLs

11.3 Cascading Style Sheets (CSS)
- Introduction to CSS
- Types of style sheets
- CSS selectors and properties
- Incorporating colour techniques
- Understanding layers and positioning
- Creating and modifying objects
- Objects on multiple layers
- Complex objects on a single layer
- Placing type in an image
- Using layers to refine images
- Creating special effects
- Behaviour modification

11.4 **Flash, video and audio**
- Introduction to media elements in web application development
- Incorporating flash into a web application
- Embedding video and audio content into a web application
- Implications of incorporating media content in web applications

11.5 **Graphics and animations**
- Fundamentals of graphics and animations
- Types of graphics
- Animation basics
- Animation tools
- Methods of animation
- Animations with motion and shape tweening
- Interactivity with frame action and buttons
- More complex animation tasks

11.6 **Web application development platforms**
- Overview of web application development platforms
- Overview of web application development software tools
- Tools of automating web applications
- Drawing timelines and customising web application development tools
- Plugins, add-ons and active content
- Web application testing
- Content management systems
- Implications of incorporating graphics and animations in web applications

11.7 **Scripting**
- Overview of script development
- Scripting languages
- Overview of client side and server side scripting
- Incorporating script into HTML
- Basic command syntax/blocks
- Functions and objects
- Built in objects and functions
- Looping
- Frames, documents and windows
- Events and cookies
- Page redirect and page printing
- Void keyword
- Database connectivity

11.8 **Publishing web applications**
- Web hosting
- Domain name registration
- Setting up a web application
- Managing web applications
- Content management
- Search engine optimisation
- Web application security
11.9 **Introduction to e-commerce**
- e-commerce concepts
- Features of e-commerce
- e-commerce business models
- Benefits and limitations of e-commerce
- Future of e-commerce

11.10 **e-Commerce infrastructure**
- Telecommunication
- Internet Service Providers (ISPs)
- Website design companies
- Human resources
- Computing resources
- Payment gateways
- Electronic Data Interchange (EDI)
- Value-added network (VAN)

11.11 **e-Commerce implementation**
- Size of enterprise
- e-commerce products and services
- e-commerce website hosting options
- e-procurement

11.12 **e-Commerce security**
- e-commerce security concepts
- Digital signatures/e-signatures
- e-commerce security standards: SSL, TSL, HTTPS
- Implementing e-commerce security

11.13 **Electronic transactions law**
- Internet applications
- e-commerce and e-marketing approach
- Digital technology
- e-contracts
- e-signatures
- Electronic records
- Electronic data
- Electronic messages
- Third parties
- Data protection laws

11.14 **Cloud computing**
- Overview of cloud computing
- Cloud computing models
- Cloud computing security
- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)
- Business Process as a Service (BPaaS)
- Enterprise cloud based high performance computing (HPC) application
- Implementing cloud based solutions

11.15 **Emerging issues and trends**
GENERAL OBJECTIVE

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to set up, configure and maintain 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
- Set up and test routers
- Configure and test various protocols in a computer network
- 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
- OSI (open system interconnection) models and layer protocols
- TC/P model and layer protocols
- Types of networks
- Network topologies
- Roles of network personnel

12.2 Networking components
- Hardware
- Software
- Bounded 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 Routing and switching
- Overview of switching and routing
- Types of switches
- Switching techniques
- Router components
- Router interfaces and protocols
- IPv4 and IPv6 configuration

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

12.6 **Administering user accounts**
- Local user accounts
- Domain user accounts
- Built in user accounts

12.7 **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

12.8 **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

12.9 **Data backup and restoration**
- Planning backup
- Backing up data
- Restoring data

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

12.11 **Network troubleshooting**
- Identifying network faults
- Physical methods of troubleshooting
- Using software tools to troubleshoot
- Fixing network faults
- Protocols and utilities commands

12.12 **Internet of things (IoT)**
- Overview of IoT
- Elements of IoT
- Radio-frequency identification (RFID)
- Sensor network
- Localization of IoT
- Big data
- Cloud computing
- Business ecosystem, scenarios and model
- IoT application areas and solutions

12.13 **Emerging issues and trends**
PART III
SECTION 5

PAPER NO.13 STRATEGY, GOVERNANCE AND ETHICS

GENERAL OBJECTIVE

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
- Overview of management functions

13.2 Development of management thought
- Pre-industrial revolution management theories
- Classical theories, neo-classical theories
- Contemporary theories

13.3 Overview of corporate strategy, governance and ethics
- Meaning of strategy, management and strategic management
- Scope of strategic management
- Levels of strategic management
- Benefits of strategic management
- Limitations of strategic management
- Meaning of Governance and Ethics
- Importance of Governance and Ethics
- Principles of good governance
- Overview of theories in governance and ethics

13.4 Strategy formulation
- Environmental analysis
- Organisational vision and mission
- Organisational goals and objectives
- Development of corporate strategy and business strategy
- Strategic options
- Strategy formulation constraints
- Competitive advantage
13.5 **Strategy implementation**
- Organisational structure
- Resource allocation
- Organisational culture
- Role of leadership on strategy implementation
- Innovation and knowledge management
- Constraints to strategy implementation
- Management of strategic change

13.6 **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

13.7 **The Board of Directors**
- Appointment, composition and size
- Role and functions
- Executive, non-executive and independent directors
- Committees of the Board
- Board meetings
- Board work plan
- Board induction and continuous skills development
- Board manual and charter
- Board performance evaluation
- Board remuneration
- Term limits for non-executive Board members
- Succession planning
- Liability and insurance indemnity
- Appointment of the Chief Executive Officer
- Appointment of the Certified Secretary
- Separation of roles
- Role of the board in performance management
- Role of the Board in stakeholders management

13.8 **Accountability, risk management and internal control**
- Financial reporting
- Integrated reporting
- Strategies and processes in enterprise risk management
- Board’s role in enterprise risk management
- Internal controls
- Internal auditor
- Audit Committee
- External auditor
- Internal Audit Charter and work plan
- Role of the Board in the procurement process

13.9 **Sustainability and social investment**
- Sustainability goals and strategy
- Triple bottom line
- Social responsibility investments
- Corporate social responsibility
- Environmental management
- Ethical issues in CSR
- Strategies and policies on CSR
- Creating and registering foundations to manage CSR
- The impact of CSR on shareholder value
- Social audit
- Corporate reputation and image

13.10 **Ethics and corporate disclosure**
- Ethical norms, morality, values and ethical culture
- Role of the board in promotion of ethical conduct
- Professional judgement
- Code of ethics
- Standards of conduct and personal integrity
- Ethical dilemmas
- Ethics committee
- Ethics training
- Conflict of interests and related party transactions
- Insider trading
- Policy and guidelines on payments and gifts
- Corporate disclosure policy and strategy
- Benefits of disclosures and transparency
- Disclosure barriers
- Financial and non-financial disclosures
- Whistle blowing

13.11 **Case studies in strategy, governance and ethics**

13.12 **Emerging issues and trends**
PAPER NO.14 SOFTWARE ENGINEERING

GENERAL OBJECTIVE

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to implement and manage the software engineering process.

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 engineering
- Overview of software engineering
- Software engineering concepts
- Software development life cycle (SDLC)
- Legal aspects in software process models

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
- Stakeholders analysis
- Need for requirement gathering techniques
- Gap analysis
- Prioritization of requirements
- 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 coding
- Coding platforms
- Approaches to software coding
- Coding styles and characteristics
- Coding in high level languages
- Coding standards
- User interface

14.6 Software testing
- Testing and debugging
- Testing platforms
- Software testing lifecycle
- Software testing methods
  - Black box testing
  - White box testing
- Software testing levels
  - Unit
  - Integration
  - System
  - Acceptance
- Other forms of testing

14.7 Conversion strategies
- Conversion planning
- Parallel running
- Direct changeover
- Pilot study
- Phased approach

14.8 Software quality
- Control and assurance
- Software quality factors and metrics
- Formal technical reviews
- Verification and validation
- Cost of quality

14.9 Software acquisition methods
- Software outsourcing
- Open-source software engineering and customisation
- In-house development
- Commercial off the-shelf software (COTS)
- Factors to consider in software acquisition

14.10 Budgeting for information systems
- Financial cost benefit analysis
- Business case approach
- Total cost of ownership
- Balance score card
- Activity based costing and expected value
- Tracking and allocations costs

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

14.12 **Software maintenance and evolution**
- Types of software changes
- Software change identification
- Software change implementation

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

14.14 **Emerging issues and trends**
GENERAL OBJECTIVE

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to develop and deploy 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
- Implement mobile applications
- Secure mobile applications

CONTENT

15.1 Mobile devices and applications
- Overview 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
- Overview of mobile database management systems

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, XML, Javascript and JQuery

15.5 iOS application development
- Window-based application and MUC
- Swift 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
- Android SDK
- Resources and views
- Intents and services
- Storage and threads

15.7 **Unstructured supplementary service data (USSD)**
- Overview of USSD code
- USSD broker
- POST request, response and status
- USSD pull

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

15.9 **Mobile application security**
- Overview of mobile application threats
- Reducing mobile risks
- Cloud based assessments and solutions
- Security strategies
- Security testing techniques and certification

15.10 **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 attitudes that will enable him/her to secure ICT systems.

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
- Principles of system security
- Classifications of systems 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 errors
- Overview of system security errors
- Human errors
- Procedural errors
- Software errors
- Electromechanical problems
- Dirty data

16.4 Systems security measures
- Physical security
- Logical security (authentication, access rights, passwords, others)

16.5 Data and software security
- Overview of data and software security
- Data and software security precautions
- Vulnerability assessment
- Employing virus security precautions

16.6 Network security
- Overview of network security
- Duplicate and alternate routing
- Network intrusion, detection and prevention
- Secure socket layer and transport layer security
- IPv4 and IPv6 security

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- Wireless network security
- Mobile device security
- Wireless protected access

16.7 **Introduction to cryptography**
- Overview of cryptography
- Encryption and decryption
- Cryptography tools and techniques
- Cryptographic attack
- Security services of cryptography
- Public key infrastructure

16.8 **ICT risk management**
- Risk management concepts
- Risk analysis
- Risk assessment
- Risk monitoring and review
- Risk mitigation
- Corporate risk document

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

16.10 **Systems security policy**
- Components of systems security policy
- Systems security policy development
- System security policy implementation
- Systems security strategies
- Systems audit

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

16.12 **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
- Vetting of ICT employees

16.13 **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 attitudes 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 systems project management software
- Initiate, develop and manage information systems projects
- Identify, monitor and control project risks
- Prepare project schedules using project management software tools
- Manage information systems project procurement process

CONTENT

17.1 Introduction to information systems project
- Overview of a project
- Characteristics of project
- Examples of information systems projects
- Project management principles
- Purpose of project management
- Information systems project environment
- Project personnel roles and responsibilities

17.2 Information systems project lifecycle
- Project identification and selection
- Project planning
- Feasibility study
- Project objectives
- Project proposal
- Project design
- Project development
- Project implementation
- Project monitoring and control
- Project review and evaluation

17.3 Project scope management
- Scope definition
- Scope verification
- Scope control
- Constraints and assumptions
- Using software tools to assist in project scope management

17.4 Project planning and scheduling
- Overview of project planning and scheduling
- Features of a good project plan
- Work breakdown structures
- Determining project tasks
- Schedule milestones
- Establishing task dependencies and relationships
- Materials and equipment management
- Tools and techniques for project planning and scheduling
- Using software tools to assist in project planning and scheduling
17.5 **IS project estimation**
- Concepts of information systems project estimation
- Problems of overestimation and underestimation
- Basis for information systems project estimation
- Tools and techniques for project estimation
- Using software tools to assist in project estimation

17.6 **IS project resource management**
- Overview of information systems project resources
- Resource planning
- Resource allocation framework
- Information resource portfolio management
- Resource schedules
- Cost management
- Materials and equipment management
- Using software tools to assist in resource management

17.7 **IS project organisational structures**
- Overview of organisational structures
- Integrating project work and project organisational structures
- Project team lifecycle
- Team management
- Using software tools to assist in project organisation

17.8 **IS project quality management**
- Overview of IS project quality management
- Project quality factors
- Quality planning, assurance and control
- Tools and techniques for quality control
- Overview of project management standards (PRINCE 2)
- ISO certification
- Using software tools to assist in quality management

17.9 **IS project communication management**
- Overview of communication management
- Establishing effective project communication
- Progress reporting
- Report writing
- Managing communication with stakeholders
- Using software tools to assist in project communication management

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

17.11 **IS project procurement management**
- Overview of procurement planning process, tools and methods
- Requesting for proposal and quotations
- Evaluation of proposals and quotations
- Contracting and contract administration
- Using software tools in project procurement management
17.12 **IS project implementation, completion and evaluation**
- Project evaluation
- Team evaluation
- Project documentation
- Change management
- Using software tools to assist in project evaluation

17.13 **Emerging issues and trends**
PAPER NO. 18 RESEARCH METHODS

GENERAL OBJECTIVE

This paper is intended to equip the candidate with the knowledge, skills and attitudes 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

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- 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 ICT tools and technologies.

19.0 LEARNING OUTCOMES

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

- Carry out independent research to address a specific ICT problem
- Identify real life information systems 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.

CONTENT

19.1 Project proposal

- Overview of project proposals
- Identification and statement of a real life ICT problem
- Investigation of the problem, stakeholder, system and user requirements
- Analysis of project feasibility and scope
- Statement of problem and project objectives
- Overview of the literature and possible solutions
- Selection of project implementation methodologies and techniques
- Project resource scheduling (budget, schedule, Gantt chart)

19.2 Project and system analysis

- Limitations of the existing system
- Potential user requirements
- Project and software inputs, processes and outputs
- Functional and non-functional requirements
- Analysis of user classes and characteristics
- Analysis of system features
- Project and system objectives
- Project and system constraints
- Assumptions and dependencies
- Writing the analysis report

19.3 System design

- Establishing conventions and rules for naming system objects
- Input, process and output design
- Developing the conceptual model
- Input content, format and validation
- Normalisation and design of the database schema
- Data validation strategy
- Module design
- User interface design
- Security and backup design
- Test design
19.4 **System development**
- Establishing the development approach and environment
- Demonstration and description of program functional requirements
- Demonstration and description of program non-functional requirements
- Coding and code documentation

19.5 **System testing**
- Establishment of test objectives
- Logical, functional, system, user acceptance and recovery testing
- Creating the test plan
- Selecting test cases
- Presenting test results

19.6 **Project documentation**
- Overview of the project report structure
- Writing the title page
- Declaration of project originality
- Project abstract
- Acknowledgements
- Table of contents
- Project chapters
  - Introduction and background
  - Literature review
  - Methodology (analysis and design)
  - System demonstration
  - Appraisal of the project (achievements, limitations, recommendations)
  - Conclusion
- References
- Appendices
  - Input documents
  - Administrative documents (terms of reference, permissions, questionnaires, etc.)
  - System installation and maintenance manual
  - User manual
  - Annotated program listings
  - Test runs, annotated and cross-referenced test plan

**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)