

SECONDARY SECTOR

DOMAIN: ENGINEERING AND TECHNOLOGY

FIELD: CIVIL ENGINEERING

SPECIALTY: CIVIL ENGINEERING TECHNOLOGY

OPTION: CIVIL ENGINEERING TECHNOLOGY

PAPER: CASE STUDY

Credit value: 10

DURATION: 06HRS

Nature of Exam: Written

Objective (s)/ of the paper: **The case study paper has as objective to evaluate the capability of the candidate to:**

- Analyse an Engineering case in order to identify short comings and develop a solution using modern techniques

Nature of the exam: written

Exam paper	option	Different sections of the paper	Duration per section	Mark allocated	percentage
case study	civil engineering technology	Quantities and specification	1hours 30minutes	5marks	20%
		Site Management	1hours 30minutes	5marks	20%
		Structural analysis	1hours 30minutes	3marks	15%
		Construction Drawing	1hours 30minutes	7marks	35%
TOTAL			6hours	20marks	100%

II- STRUCTURE OF THE PAPER

The paper is constituted of four parts:

Part I: Quantities and specification

Approximate duration: 1hour 30minutes; weighting: 20%; Marks: 5mks

Quantities

This part is based on the study of; main types of contracts,

- Contractual procedures,
- methods of tendering and contract documents, The construction procedures,
- Price Study (quantities and cost of materials, equipment and labour),
- Selling price of a project selling coefficient.

Specification

This part is based on the study of; main types of contracts,

- Review the meaning of specification.
- Review types of specifications.
- Review the importance of specification.
- Discuss the basic requirements in writing a good specification.
- Explain the need for liaison in writing specification.
- Explain the logical development of requirements of items.
- Enumerate the use of drawings in writing engineering specifications.
- Explain the structure of a specification.
- Discuss the use of communication in specification writing.
- List the excluded items.
- Discuss the use of (i) historical and background information, (ii) ancillary documents (iii) environmental aspects.
- Discuss the importance of the following in specification writing: (a) Scope of operation (b) Functional characteristics.
- Design specification.
- Write simple specifications for minor works.

Part II: Site Management

Approximate duration: 1hour 30 minutes; weighting: 20%; Marks: 5mks

Scientific organisation of work (work breakdown, minimisation of expenditures on site, prevention of disorder on site), Site plan layout, Establishment of project realization programs (planning, job scheduling, site control), concrete works equipment, Earth works equipment, earth transportation works, Depreciation of Equipment, management of material stock, Procedure for payment for construction works, Management of formwork on site.

Part III: Structural analysis

Approximate duration: 1hour 30 minutes; weighting: 15%; Marks: 3mks

This part is based on the study of: shear force and bending moments and their diagrams for statically determinate structure (beams, columns, portal frames), shear force and bending moments and their diagrams for:

- One degree of statics indeterminacy (using equation or any other method)
- Continuous beams
- Statically indeterminate portal frame with no side sway using the slope and deflection method

Part IV: Construction Drawing

Approximate duration: 1hour 30 minutes; weighting: 35%; Marks: 7mks

This part is based on the study of;

- formwork (plan, section),

- reinforcement drawing (plans, sections, details),
- stairs (plans, sections, reinforcement details),
- building plans (plans, sections, details, electrical installations, water supply and drainage),
- metallic, open construction drawings (plans, sections, details)

III- PRESENTATION OF THE PAPER

- All the parts shall have a link to a common real engineering situation or case that must have been described at the beginning of the paper.
- Each part is presented in the form of analysis; the questions can be a brief description.
- Sketches and drawings should be clear and legible and must contain all necessary details and information
- Each question shall be allocated a mark distributed rationally and logically.
- Precise the instructions to candidates pertaining to the answering of the questions
- Precise in details the necessary materials to give to candidates

IV- ASSESSMENT CRITERIA

The assessment is based on the following elements:

- Comprehension of the case presented
- Pertinence of analysis
- Presentation of drawings / sketches and other illustrations
- Exactitude of calculations

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated
- Answers should be complete with appropriate marks distribution that ties with the question paper.

PAPER: DESIGN OF STRUCTURAL ELEMENT

Field: **civil engineering**

Specialty: **civil engineering technology**

Option: **civil engineering technology**

Credit value: 4

DURATION: 03HRS

Nature of Exam: Written

Objective (s)/ of the paper: **This paper has as objectives to assess the ability of the candidates to analyse and solve problems in reinforced concrete.**

CodeBael 91 or 99

Nature of the exam: written

Exam paper	Option	Different sections of the paper	Duration per section	Mark allocated	percentage
DESIGN OF STRUCTURAL ELEMENT	civil engineering technology	Reinforced concrete Code Bael 91 or 99	1hour 30 minute	10marks	50%
		Pre-stressed Concrete	45 minutes	5marks	25%
		Steel and Timber Design	45 minutes	5marks	25%
TOTAL			3hours	20marks	100%

PAPER: DESIGN OF STRUCTURAL ELEMENT

II- STRUCTURE OF THE PAPER

The paper is composed of three parts:

Part I: Reinforced Concrete design

Code BAEL 91 OR 99

Approximate duration: 1hour30 minutes; weighting: 50%; Marks: 10mks

This part is based on the study of; Reinforcement of rectangular, or T, or L beams cross sections from continuous beams using the forfaitaire method, caquots method, or three moment method of analysis, Area of reinforcement steel for ribbed beams, one way or two ways spanning slabs and stairs; columns and foundations(pad, strip)

Part II: Pre-stressed Concrete

Approximate duration: 45minutes; weighting: 25%; Marks: 5mks

This part is based on the study of:

- Pre-stressing methods and Technology, determination of minimum pre-stressing force for zero tension at the bottom of the beam at mid-span,
- sizing of rectangular pre-stressed concrete beams (breath and depth), determination of pre-stressed stress diagrams at mid-span and at edges for straight tendons,
- Determination of tendons zone in curved tendons, pre-stressed losses.

Part III: Steel and Timber Design

This part is based on the study of:

- Mode of failure of beams and columns, design of uncased beams, cased beams, columns, columns bases, wood technology (classes of wood, wood preservation, structure of timber, seasoning.)

III-PRESENTATION OF THE PAPER

- Each of the parts shall be clearly distinguished
- Each part is presented in the form of analysis; the questions can be a brief description or diagrams.
- Sketches and drawings should be clear and legible and must contain all necessary details and information
- Each question shall be allocated a mark distributed rationally and logically.
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to be given to candidates

IV- ASSESSMENT CRITERIA

- Comprehension of the case presented
- Analysis of problem
- Presentation of sketches and illustrations
- Exactitude of calculations

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated
- Answers should be complete with appropriate marks distribution that ties with the question paper.

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PAPER: CIVIL ENGINEERING TECHNOLOGY PRACTICE

Field: **civil engineering**

Specialty: **civil engineering technology**

Option: **civil engineering technology**

Credit value:5

Duration: 03HRS

Nature of Exam: Practicals

Objective (s)/ of the paper;the objective of this paper is to evaluate the ability of the candidate to:

- Use topographic instruments to carry out and control works , Carryout levelling for the purpose of earth works
- Carryout setting out using topographic equipment.
- Carryout the production of reinforced concrete elements
- Carryout test on soils, cement, mortars and concrete.

Nature of the exam: **written**

Exam paper	option	Different sections of the paper	Duration per section	Mark allocated	percentage
CIVIL ENGINEERING PRACTICE	civil engineering technology	Construction practice	5hours	20marks	100%
		Practical engineering survey	5hours	20marks	100%
		Test on civil materials	5hours	20marks	100%
TOTAL			5hours	20marks	100%

PAPER: PRACTICE OF BUILDING SCIENCE AND TECHNOLOGY

Nature: practical;

Duration: 5 hours

Credit: 5

I- OBJECTIVE OF THE PAPER

The objective of this paper is to evaluate the ability of the candidate to:

- Use topographic instruments to carry out and control works
- Carryout leveling for the purpose of earth works
- Carryout setting out using topographic equipment.
- Carryout the production of reinforced concrete elements
- Carryout test on soils, cement, mortars and concrete

II- STRUCTURE OF THE PAPER

The paper is composed of three parts:

Each of the parts carries equal marks and equal duration. Each candidate is expected to answer only one of the parts which shall be chosen through secret ballots

Part I: Construction Practice

Approximate duration: 5hours; weighting: 100%; Marks: 20mks

This part is based on the study of; Reinforcement and formwork of building elements, implantation and setting out of buildings

Part II: Practical Engineering Surveys

Approximate duration: 5hours; weighting: 100%; Marks: 20mks

This part is based on the study of:

Building site leveling, Building implantation and setting out (both field works and office works)

Part III: Test on construction Materials

Approximate duration: 5hours; weighting: 100%; Marks: 20mks

This part is based on the study of:

Water content test on soils, Sand Equivalent test, grading test (sieve analysis), slump test, Dry density test, Proctor Test, Basic Tests on Cement

III- PRESENTATION OF THE PAPER

The paper shall be presented in the following manner:

- The marks allocation should be presented in details both for office and field works
- Precise the various stages and materials to be prepared in advance
- Preview all the working forms and all the annex documents required
- Clearly precise the methods to use in function of standard instruments
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to give to candidates

IV- ASSESSMENT CRITERIA

The assessment is based on the following elements:

- Mastering of the instrument
- Sampling or collection of data
- Manipulation and interpretation of results

PAPER: GEOTECHNICS

Field: Civil Engineering

Specialty: Civil Engineering Technology

Option: Civil Engineering Technology

Credit value: 4

Duration: 03HRS

Nature of Exam: Written

Objective (s)/ of the paper: The objective of this paper is to evaluate the ability of the candidate on the:

- parameters of soils, soils characteristics and water flow in soils
- calculations of soils stresses, and shear
- analyse foundations, retaining walls and soils compressions.

Nature of the exam: **written**

Exam paper	option	Different sections of the paper	Duration per section	Mark allocated	percentage
GEOTECHNICS	civil engineering technology	Soil mechanics	1hour	7marks	35%
		Stresses and pressure on soil	1hour	7marks	35%
		Foundation and retaining walls	1hour	7marks	35%
TOTAL			3hours	20marks	100%

PAPER: GEOTECHNICS

Nature: written; Duration: 3 hours; Credits: 4

I- OBJECTIVE OF THE PAPER

The objective of this paper is to evaluate the ability of the candidate on the:

- parameters of soils, soils characteristics and water flow in soils
- calculations of soils stresses, and shear
- analyse foundations, retaining walls and soils compressions

II- STRUCTURE OF THE PAPER

The paper is composed of two parts as follows

Part I: soil mechanics

Approximate duration: 1hour; weighting: 35%; Marks: 7mks

- Physical characteristics of soils (identification and classification, trials)
- Water in the soil (hydraulic properties of soils)
- Consolidation and compaction of soils
- stresses and pressures on soils

Part II: Foundations retaining structures

Approximate duration: 1hour; weighting: 35%; Marks: 7mks

.this part tests the candidate on the calculation of;

Shear strength, Earth pressures, Retaining structures, Shallow foundations, Deep foundations

Part III:Foundation and retaining walls

Approximate duration: 1hour; weighting: 35%; Marks: 7mks

This part is based on the study of;

The analysis of foundation and retaining wall and also soil compaction

III- PRESENTATION OF THE PAPER

- Each of the parts shall be clearly distinguished
- Each part is presented in the form of analysis; the questions can be a brief description or diagrams.
- Sketches and drawings should be clear and legible and must contain all necessary details and information
- Each question shall be allocated a mark distributed rationally and logically.
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to be given to candidates

IV- ASSESSMENT CRITERIA

- Comprehension of the case presented
- Analysis of problem

-Presentation of sketches and illustrations

-Exactitude of calculations

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated

- Answers should be complete with appropriate marks distribution that ties with the question paper.

PAPER: CONSTRUCTION TECHNOLOGY

Field: Civil Engineering

Specialty: Civil Engineering Technology

Option: Civil Engineering Technology

Credit value:4

Duration: 04HRS

Nature of Exam: Written

Objective (s)/ of the paper: The Technology Paper is aimed at assessing the ability of the candidate to:

- Identify the most recent techniques and methods of construction
- Understand a technological situation, analyse the problems involve and proposed developed solutions that correspond to modern technology.

Nature of the exam: written

Exam paper	option	Different sections of the paper	Duration per section	Marks allocated	percentage
CONSTRUCTION TECHNOLOGY	civil engineering technology	construction process and preliminary site work	45minutes	4marks	20%
		Substructure	1hour 30minutes	7marks	35%
		Superstructure	1hour 15 minutes	6marks	30%
		Building services and external works	30minutes	3marks	15%
TOTAL			3hours	20marks	100%

PAPER: CONSTRUCTION TECHNOLOGY

Nature: Practical; Duration: 3 hours; Credits: 3

I- OBJECTIVE OF THE PAPER

The Technology Paper is aimed at assessing the ability of the candidate to:

- Identify the most recent techniques and methods of construction
- Understand a technological situation, analyse the problems involve and proposed developed solutions that correspond to modern technology.
- Suggest alternatives remedies to diverse cases that may not be able to be solve by traditional methods.

II- STRUCTURE OF THE PAPER

The paper is composed of four parts:

Part I: construction process and preliminary site work

Approximate duration: 45 minutes; weighting: 20%; Marks: 4mks

This part is based on the study of;

- Choice of the building site
- Site clearance
- Site investigation
- Field method of soil investigation
- Subsoil drainage
- Site installation and the type of excavation

Part II: Substructure

Approximate duration: 1hour30minutes, weighting: 35%; Marks: 7mks

This part is based on the study of:

- The control of ground water in excavation
- Types of foundations
- Design , selection , basement and the diaphragm wall construction
- Timbering to excavation
- Retaining wall
- Cofferdams
- Sheet piling and caissons

Part III: Superstructure

Approximate duration: 1hour15minutes, weighting: 30%; Marks: 6mks

This part is based on the study of:

- General wall construction
- Floors
- Openings to building
- Pre-stressed concrete
- Roof
- Frame structure
- Finishing to building

Part IV: Building services and external works

Approximate duration: 30minutes; weighting: 15%; Marks: 3mks

This part is based on the study of:

- Thermal and sound insulation

- Drainage (surface and domestic), water supply and the external work
- Electrical installation and supply

III- PRESENTATION OF THE PAPER

- The parts should be presented in an analysis nature that is; asked questions from a brief description.
- Interpretation of sketches/drawing can be envisaged.
- Each part shall allocated marks and the distribution of marks should be rational and logical.
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to give to candidates

IV- ASSESSMENT CRITERIA

- Comprehension of the case presented
- Analysis of problem
- Presentation of sketches and illustrations
- Chronology and order of presentation of ideas

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated
- Answers should be complete with appropriate marks distribution that ties with the question paper.

PAPER: COMPUTER AIDED DESIGN (CAD)

Field: **civil engineering**

Specialty: **civil engineering technology**

Option: **civil engineering technology**

Credit value: 3

Duration: 03HRS

Nature of Exam: Practical

Objective (s)/ of the paper: The COMPUTER AIDED DESIGN (CAD)Paper is aimed at assessing the ability of the candidate to:

Nature of the exam: Practical

Format of the exam:

Exam paper	option	Different sections of the paper	Duration per section	Marks allocated	percentage
COMPUTER AIDED DESIGN (CAD)	civil engineering technology	. drawing with AutoCAD or archicad interface and basic tools	3hours	20marks	100%
TOTAL			3hours	20marks	100%

SUBJECTS: COMPUTER AIDED DESIGN (CAD)

I. Presenting AutoCAD or Archicad interface and basic tools

- 1- Auto Cad Main Window
- 2- Presenting the basic tools or commands
- 3- Starting a New Drawing
- 4- Opening an Existing Drawing,
- 5- Saving a Drawing File,
- 6- Exiting an AutoCAD Session

II. Choosing Commands in AutoCAD or archicad

- 1- Pull-down Menus,
- 2- Tool Bar Selection,
- 3- Activating Tool Bars,

III. The Coordinate system

- Cartesian Coordinates,

- Polar Coordinates,
- User defined coordinates

IV. Using drawing and modification tools in creating architectural and technical drawing

- 1- Drawing tools: Circles, ellipse, Line, multi-line, poly line etc.
- 2- Modification Tools: erase, trim, adjust etc.

V. Creating hatch and gradient

VI. Creating blocks

VII. Managing layers

VIII. Printing processes

III- PRESENTATION OF THE PAPER

- The parts should be presented in an analysis nature that is; asked questions from a brief description.
- Interpretation of sketches/drawing can be envisaged.
- Each part shall allocated marks and the distribution of marks should be rational and logical.
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to give to candidates

IV- ASSESSMENT CRITERIA

- Comprehension of the case presented
- Analysis of problem
- Presentation of sketches and illustrations
- Chronology and order of presentation of ideas

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated
- Answers should be complete with appropriate marks distribution that ties with the question paper.

FIELD: CIVIL ENGINEERING

SPECIALTY: URBAN PLANNING

OPTION : URBAN PLANNING

PAPER: CASE STUDY

Sector: *Secondary*

Exam paper: *Case Study*

Field: *Civil Engineering*

Specialty: *Urban Planning*

Credit value: 8

Objective(s) of the paper: Providing students with varied practical experience of realistic planning problems including:

- Growth patterns of large population concentration and the associated problems and planning
- Planning, sourcing revenue, implementation , monitoring and evaluation of projects
- Transportation studies; design carriageway; and management of traffic problems
- National economic structure , growth and global economy
- **Building Materials Science**

Nature of the exam: written

Format of the exam

Exam paper	Option	Different sections of the paper	Duration per paper	Mark allocated	Percentage
Case study	Urban planning	Section A: Organization of Work Site and Demography	5 hours	30	30
		Section B: cycle and management of urban projects		20	20
		Section C: Urban Planning Project and Urban Transportation		30	30
		Section D: Construction Materials		20	20
Total				100	100

PAPER: ENGINEERING MATHEMATICS

Sector: *Secondary*

Exam paper: *Engineering Mathematics*

Field: *Civil Engineering*

Specialty: *Urban Planning*

Credit value: 9

Objective of the paper: Providing students with basic knowledge of engineering mathematics:

- Basic engineering mathematics

Nature of the exam: written

Format of the exam

Exam paper	Option	Different sections of the paper	Duration per paper	Mark allocated	Percentage
<i>Engineering Mathematics</i>	Urban planning	Section A: mathematics I	4 hours	40	40
		Section B: mathematics II		30	30
		Section C: mathematics III		30	30
Total				100	100

Sector: *Secondary*

PAPER: STATISTICS

Field: *Civil Engineering*

Specialty: *Urban Planning*

Credit value: 9

Objective(s) of the paper : Providing students with basic knowledge of statistics in planning:

- statistics for planning analysis

Nature of the exam: written

Format of the exam

Exam paper	Option	Different sections of the paper	Duration per paper	Mark allocated	Percentage
Statistics	Urban planning	Statistics	3hours	100	100
Total				100	100

PAPER: PLANNING DESIGN AND PRACTICE

Sector: *Secondary*

Exam paper: *Planning Design and Practice*

Field: *Civil Engineering*

Specialty: *Urban Planning*

Credit value: 9

Objective(s) of the paper: Providing students practical experience design methods and techniques for planning, including:

- layout design concepts and practice
- Photo Interpretation of aerial photography, optics for photogrammetry, metric cameras, ground coverage and resolution
- Reconnaissance survey and Global Positioning System tracking
- Application of Computer –Assisted Cartography and Geographic Information System software in Spatial design

Nature of the exam: Practical

Format of the exam

Exam paper	Option	Different sections of the paper	Duration per paper	Mark allocated	Percentage
Planning Design and Practice	Urban planning	Part A: field reconnaissance survey of a neighbourhood	3 hours	40	40
		Part B: studio design using computer –assisted cartography and geographic information system software	3 hours	60	60
Total				100	100

PAPER: URBAN PLANNING MANAGEMENT

Sector: *Secondary*

Exam paper: *Urban Planning Management*

Field: *Civil Engineering*

Specialty: *Urban Planning*

Credit value: 8

Objective(s) of the paper: Providing students with practical experience of urban management including:

- The nature of urban problems and management strategies.
- Sustainability of the environment vis-a-vis physical development and urban growth
- National government's sources and management of resources.
- Raising revenue for different types of projects

Nature of the exam: written

Format of the exam

Format of the Exam					
Exam paper	Option	Different sections of the paper	Duration per paper	Mark allocated	Percentage
Urban Planning Management	Urban planning	Section A: Knowledge of environment	3 hours	30	30
		Section B: Public and local finance		30	30
		Section C: Urban highway and sanitation I and II		40	40
Total				100	100

PAPER: PHYSICAL AND SOCIO-ECONOMIC PLANNING

Sector: *Secondary*

Exam paper: *Physical and Socio-Economic Planning*

Field: *Civil Engineering*

Specialty: *Urban Planning*

Credit value: 6

Objective(s) of the paper: Providing students with practical experience of urban space interaction including:

- Urban grouping social transformation.
- Functional relationship and housing provisioning
- Land value and land rent within urban space and how it influences location of firms and households over urban space.
- Analysis of urban space interaction

Nature of the exam: written

Format of the exam

Exam paper	Option	Different sections of the paper	Duration per paper	Mark allocated	Percentage
Physical and Socio-Economic Planning	Urban planning	Section A: Urban Sociology and Urban Habitat	3 hours	60	60
		Section B: Urban Economics and Techniques of Investigation		40	40
Total				100	100

PAPER: PLANNING LAW AND PROFESSIONAL PRACTICE

Sector: *Secondary*

Exam paper: *Planning Law and Professional Practice*

Field: *Civil Engineering*

Specialty: *Urban Planning*

Credit value: 2

Objective(s) of the paper: Providing students with practical experience of urban land uses and planning law including:

- Urban land uses and land use theories
- Urban planning regulatory instruments and their applications
- Code of professional ethic and practice of urban planning

Nature of the exam: written

Format of the exam

Format of the exam					
Exam paper	Option	Different sections of the paper	Duration per paper	Mark allocated	Percentage
Planning Law and Professional Practice	Urban planning	Section A: Town Planning	2 ½ hours	60	60
		Section B : Town Regulations		40	40
Total				100	100

SPECIALTY: CIVIL ENGINEERING TECHNOLOGY

OPTION: BUILDING SCIENCE AND TECHNOLOGY

PAPER: CASE STUDY

Credit value: **10**

Duration: 06HRS

Nature of Exam: Written

Objective (s)/ of the paper: **The case study paper has as objective to evaluate the capability of the candidate to:**

- **Analyse an Engineering case in order to identify short comings and develop a solution using modern techniques**

Nature of the exam: **written**

Exam paper	Option	Different sections of the paper	Duration per section	Mark allocated	percentage
case study	Building Science and Technology	Construction drawing	2hours	7marks	35%
		Site Management	1hours 30minutes	5marks	25%
		Quantities and Cost Estimates	1hours 30minutes	5marks	25%
		Construction materials	1hours	3marks	15%
TOTAL			6hours	20marks	100%

II- STRUCTURE OF THE PAPER

The paper is constituted of four parts:

Part I: Construction drawing

Approximate duration: 2hours; weighting: 35%; Marks: 7mks

This part is based on the study of; Formwork (plans, sections), Reinforcement Drawing(plans, sections, details), Stairs (plans, sections, reinforcement details), Building plans (plans, sections, details, electrical installations, water supply and drainage), metallic, wooden construction drawings(plans, sections, details)

Part II: Site Management

Approximate duration: 1hour 30 minutes; weighting: 25%; Marks: 5mks

Scientific organisation of work (work breakdown, minimisation of expenditures on site, prevention of disorder on site), Site plan layout, Establishment of project realization programs (planning, job scheduling, site control), concrete works equipment, Earth works equipment, earth transportation works, Depreciation of Equipment, management of material stock, Procedure for payment for construction works, Management of formwork on site.

Part III: Quantities and Cost Estimates

Approximate duration: 1hour 30 minutes; weighting: 25%; Marks: 5mks

This part is based on the study of: main types of contracts, Contractual procedures, methods of tendering and contract documents, The construction procedures, Price Study (quantities and cost of materials, equipment and labour), Selling price of a project selling coefficient.

Part IV: Construction materials

Approximate duration: 1hour 30 minutes; weighting: 15%; Marks: 3mks

This part is based on the study of building construction materials, Stones Bricks Lime Cement Timber ,Study of concrete Plain Concrete ,Reinforced Cement Concrete (R.C.C.) ,Reinforced Brick Concrete (RBC) Prestressed Concrete (PSC) metals as building materials Ferrous Metals ,Aluminium ,Copper miscellaneous building materials (Glass, Plastics, Bitumen ,Asbestos, Paints Distempers ,Varnishes)

III- PRESENTATION OF THE PAPER

- All the parts shall have a link to a common real engineering situation or case that must have been described at the beginning of the paper.
- Each part is presented in the form of analysis; the questions can be a brief description.
- Sketches and drawings should be clear and legible and must contain all necessary details and information
- Each question shall be allocated a mark distributed rationally and logically.
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to give to candidates

IV- ASSESSMENT CRITERIA

The assessment is based on the following elements:

- Comprehension of the case presented
- Pertinence of analysis
- Presentation of drawings / sketches and other illustrations
- Exactitude of calculations

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated
- Answers should be complete with appropriate marks distribution that ties with the question paper.

PAPER: DESIGN

Field: **Civil And Structural Engineering**

Specialty: **Civil Engineering**

Option: **Building Science And Technology**

Credit value:4

Duration: 03HRS

Nature of Exam: Written

Objective (s)/ of the paper: **This paper has as objectives to assess the ability of the candidates to analyse and solve problems in reinforced concrete.**

Code BAEL 91 or 99

Nature of the exam: **written**

Exam paper	Option	Different sections of the paper	Duration per section	Mark allocated	percentage
DESIGN	Building Science and Technology	Reinforced Concrete design code BAEL 91 or 99	1hours 45 minutes	12marks	60%
		Structural Analysis	1hours 15minutes	8marks	40%
TOTAL			3hours	20marks	100%

II- STRUCTURE OF THE PAPER

The Paper Is Composed Of Three Parts:

Part I: Reinforced Concrete Design

Code BAEL 91 OR 99

Approximate duration: 1hour 40 minutes; weighting: 60%; Marks: 12mks

This part is based on the study of; Reinforcement of rectangular, or T, or L beams cross sections from continuous beams using the forfaitaire method, caquots method, or three moment method of analysis, Area of reinforcement steel for ribbed beams, one way or two ways spanning slabs and stairs; columns and foundations(pad, strip)

Part II: Structural Analysis

Approximate duration: 1hour 20 minutes; weighting: 40%; Marks: 8mks

This part is based on the study of: centers of gravity , first moment of area second moment of area or quadratic moment, stressed in a beam combined load stress, the middle third rule for rectangular sections trusses , geometrical stability of trussed , ritters method or method of sections, graphical

resolution of trussed shear force and Bending moments and their diagrams for statically determinate structures (beams, columns, portal frames), shear force and Bending moments and their diagrams for:

- one degree of statics indeterminacy (using deflection equation or any other method)
- Continuous beams
- Statically indeterminate portal frame with no side sway using the slope and deflection method

III- PRESENTATION III- PRESENTATION OF THE PAPER

- Each of the parts shall be clearly distinguished
- Each part is presented in the form of analysis; the questions can be a brief description or diagrams.
- Sketches and drawings should be clear and legible and must contain all necessary details and information
- Each question shall be allocated a mark distributed rationally and logically.
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to be given to candidates

IV- ASSESSMENT CRITERIA

- Comprehension of the case presented
- Analysis of problem
- Presentation of sketches and illustrations
- Exactitude of calculations

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated
- Answers should be complete with appropriate marks distribution that ties with the question paper.

BUILDING SCIENCE AND TECHNOLOGY

Field: **Civil And Structural Engineering**

Specialty: **Civil Engineering**

Option: **Building Science and Technology**

Credit value:5

Duration: 05HRS

Nature of Exam: Practical

Objective (s)/ of the paper: the objective of this paper is to evaluate the ability of the candidate to:

- Use topographic instruments to carry out and control works, Carryout levelling for the purpose of earth works
- Carryout setting out using topographic equipment.
- Carryout the production of reinforced concrete elements
- Carryout test on soils, cement, mortars and concrete.

Nature of the exam: **written**

Exam paper	Option	Different sections of the paper	Duration per section	Mark allocated	percentage
PRACTICE OF BUILDING SCIENCE AND TECHNOLOGY	Building Science and Technology	Part I: Construction Practice	5hours	20marks	100%
		Part II: Practical Engineering Surveys	5hours	20marks	100%
		Part III: Test on construction Materials	5hours	20marks	100%
TOTAL			5hours	20marks	100%

Nature: Practical; Duration: 5 hours; CREDIT: 5

I- OBJECTIVE OF THE PAPER

The objective of this paper is to evaluate the ability of the candidate to:

- Use topographic instruments to carry out and control works
- Carryout leveling for the purpose of earth works
- Carryout setting out using topographic equipment.

- Carryout the production of reinforced concrete elements
- Carryout test on soils, cement, mortars and concrete

II- STRUCTURE OF THE PAPER

The paper is composed of three parts:

Each of the parts carries equal marks and equal duration. Each candidate is expected to answer only one of the parts which shall be chosen through secret ballots

Part I: Construction Practice

Approximate duration: 5hours; weighting: 100%; Marks: 20mks

This part is based on the study of; Reinforcement and formwork of building elements, implantation and setting out of buildings

Part II: Practical Engineering Surveys

Approximate duration: 5hours; weighting: 100%; Marks: 20mks

This part is based on the study of:

Building site leveling, Building implantation and setting out (both field works and office works)

Part III: Test on construction Materials

Approximate duration: 5hours; weighting: 100%; Marks: 20mks

This part is based on the study of:

Water content test on soils, Sand Equivalent test, grading test (sieve analysis), slump test, Dry density test, Proctor Test, Basic Tests on Cement

III- PRESENTATION OF THE PAPER

The paper shall be presented in the following manner:

- The marks allocation should be presented in details both for office and field works
- Precise the various stages and materials to be prepared in advance
- Preview all the working forms and all the annex documents required
- Clearly precise the methods to use in function of standard instruments
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to give to candidates

IV- ASSESSMENT CRITERIA

The assessment is based on the following elements:

- Mastering of the instrument
- Sampling or collection of data
- Manipulation and interpretation of results

PAPER: GEOTECHNICS

Field: **Civil and Structural Engineering**
Specialty: **Civil Engineering**
Option: **Building Science and Technology**
Credit value: **4**
Duration: 03HRS

Nature of Exam: Written

Objective (s)/ of the paper: The objective of this paper is to evaluate the ability of the candidate on the:

- parameters of soils, soils characteristics and water flow in soils
- calculations of soils stresses, and shear
- analyse foundations, retaining walls and soils compressions.

Nature of the exam: **written**

Exam paper	Option	Different sections of the paper	Duration per section	Mark allocated	percentage
GEOTECHNICS	Building Science and Technology	Soils mechanics	1hours 30 minutes	10marks	50%
		Foundations retaining structures	1hours 30minutes	10marks	50%
TOTAL			3hour	20marks	100%

Nature: writing; Duration: 3hours; credits: 4

I- OBJECTIVE OF THE PAPER

The objective of this paper is to evaluate the ability of the candidate on the:

- parameters of soils, soils characteristics and water flow in soils
- calculations of soils stresses, and shear
- analyses foundations, retaining walls and soils compressions

II- STRUCTURE OF THE PAPER

The paper is composed of two parts as follows

Part I: soil mechanics

Approximate duration: 1hour 30minutes; weighting: 50%; Marks: 10mks

This part tests the candidate on

- Physical characteristics of soils (identification and classification, trials)
- Water in the soil (hydraulic properties of soils)
- Consolidation and compaction of soils
- stresses and pressures on soils

Part II: Foundations retaining structures

Approximate duration: 1hour30minute; weighting: 50%; Marks: 10mks

This part tests the candidate on the calculation of;

Shear strength, Earth pressures, Retaining structures, Shallow foundations, Deep foundations

III- PRESENTATION OF THE PAPER

- Each of the parts shall be clearly distinguished
- Each part is presented in the form of analysis; the questions can be a brief description or diagrams.
- Sketches and drawings should be clear and legible and must contain all necessary details and information
- Each question shall be allocated a mark distributed rationally and logically.
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to be given to candidates

IV- ASSESSMENT CRITERIA

- Comprehension of the case presented
- Analysis of problem
- Presentation of sketches and illustrations
- Exactitude of calculations

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated
- Answers should be complete with appropriate marks distribution that ties with the question paper.

PAPER: TECHNOLOGY

Field: **Civil and Structural Engineering**

Specialty: **Civil Engineering**

Option: **Building Science And Technology**

Credit Value:4

Objective (s)/ of the paper: **The Technology Paper is aimed at assessing the ability of the candidate to:**

Identify the most recent techniques and methods of construction

- **Understand a technological situation, analyse the problems involve and proposed developed --- solutions that correspond to modern technology.**

Nature of the exam: **written**

Exam paper	Option	Different sections of the paper	Duration per section	Marks allocated	percentage
TECHNOLOGY	Building Science and Technology	General construction process	1hours	7marks	35%
		Processes and techniques of realization	1hours	6marks	30%
		Building equipment	30minutes	3marks	15%
		Design and building technology	30minutes	4marks	20%
TOTAL			3hours	20marks	100%

Nature: Practical; Duration: 3 hours; credits: 3

I- OBJECTIVE OF THE PAPER

The Technology Paper is aimed at assessing the ability of the candidate to:

- Identify the most recent techniques and methods of construction
- Understand a technological situation, analyse the problems involve and proposed developed solutions that correspond to modern technology.
- Suggest alternatives remedies to diverse cases that may not be able to be solve by traditional methods.

II- STRUCTURE OF THE PAPER

The paper is composed of four parts:

Part I: General construction process

Approximate duration: 1hour; weighting: 35%; Marks: 7mks

This part is based on the study of;

Choice of building sites, site investigation, Field methods of soil investigation, Ground water drainage (lowering), setting-out and Excavations

Part II: Processes and techniques of realization

Approximate duration: 1hour; weighting: 30%; Marks: 6mks

This part is based on the study of:

Ground water lowering, foundation(types, design, selection), Basement and Diaphragm construction, Excavation, Trenching and Temporal supports to excavations, Retaining walls, cofferdams, sheet piling, and caissons. Underpinning

Part III: Design and building technology

Approximate duration: 30minutes; weighting: 20%; Marks: 4mks

This part is based on the study of:

General wall construction, floors, accesses to buildings and openings, Roofs, Frame structures,

Finishing to buildings. Drainage, Flooring and Pavements Wall Construction (Internal and external)

Roofs: Functions, Types and Parts, etc. Finishing: Function and Types (Tiles, Plastering, Painting, etc.)

Part IV: Building equipment

Approximate duration: 30minutes; weighting: 15%; Marks: 3mks

This part is based on the study of:

Fundamental size (flux, intensity, Luminance), Sources and lighting equipment

Interior lighting (plan and networks), Natural and mixed lighting

Technology of electrical installations .Thermal and Sound Insulation, Drainage (surface and domestic), water supply and external works, Supply

III- PRESENTATION OF THE PAPER

- The parts should be presented in an analysis nature that is; asked questions from a brief description.
- Interpretation of sketches/drawing can be envisaged.
- Each part shall allocated marks and the distribution of marks should be rational and logical.
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to give to candidates

IV- ASSESSMENT CRITERIA

- Comprehension of the case presented
- Analysis of problem
- Presentation of sketches and illustrations
- Chronology and order of presentation of ideas

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated
- Answers should be complete with appropriate marks distribution that ties with the question paper.

PAPER: COMPUTER AIDED DESIGN (CAD)

Field: **Civil and Structural Engineering**

Specialty: **Civil Engineering**

Option: **Building Science and Technology**

Credit Value: 3

- IX. Objective (s)/ of the paper: the computer aided design (cad) paper is aimed at assessing the ability of the candidate to: using drawing and modification tools in creating architectural and technical drawing

Nature of the exam: written

Format of the exam:

Exam paper	Option	Different sections of the paper	Duration per section	Marks allocated	percentage
COMPUTER AIDED DESIGN (CAD	Building Science and Technology	.drawing with AutoCAD or Archicad interface and basic tools	3hours	20marks	100%
TOTAL			3hours	20marks	100%

SUBJECTS: Computer Aided Design (CAD)

X. Presenting AutoCAD or archicad interface and basic tools

- 7- Auto Cad Main Window
- 8- Presenting the basic tools or commands
- 9- Starting a New DrawingS
- 10- Opening an Existing Drawing,
- 11- Saving a Drawing File,
- 12- Exiting an AutoCAD Session

XI. Choosing Commands in AutoCAD or archicad

- 4- Pull-down Menus,
- 5- Tool Bar Selection,
- 6- Activating Tool Bars,

XII. The Coordinate system

- Cartesian Coordinates,
- Polar Coordinates,
- User defined coordinates

XIII. Using drawing and modification tools in creating architectural and technical drawing

- 3- Drawing tools: Circles, ellipse, Line, multi-line, poly line etc.
- 4- Modification Tools: erase, trim, ajust etc.

- XIV. Creating hatch and gradient**
- XV. Creating blocks**
- XVI. Managing layers**
- XVII. Printing processes**

III- PRESENTATION OF THE PAPER

- The parts should be presented in an analysis nature that is; asked questions from a brief description.
- Interpretation of sketches/drawing can be envisaged.
- Each part shall allocated marks and the distribution of marks should be rational and logical.
- Precise the instructions to candidates patterning to the answering of the questions
- Precise in details the necessary materials to give to candidates

IV- ASSESSMENT CRITERIA

- Comprehension of the case presented
- Analysis of problem
- Presentation of sketches and illustrations
- Chronology and order of presentation of ideas

V- MARKING GUIDES

- The paper must be accompanied with standard marking guide well elaborated
- Answers should be complete with appropriate marks distribution that ties with the question paper.