



2026

BRICS SKILLS COMPETITION
(BRICS+ FUTURE SKILLS & TECH CHALLENGE)

Digital Construction Design

BRICS-FS-69

Test Project
Offline/Online (International Final)

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General Instructions

Total Exam Time: 6 hours (360 minutes). The duration covers both the Theoretical Part and the Practical Part. Competitors are responsible for budgeting and allocating their time dynamically across both components.

Assessment Format: Theoretical Part (Closed-book computer-based exam) + Practical Part (On-machine practical operations & Collaboration platform operations).

Part I: Theoretical Part

Task Overview:

This module serves as a comprehensive theoretical knowledge assessment. It is engineered to evaluate competitors' integrated understanding and application tracking of two core knowledge structures: the New Era 'Good Housing' Construction Guidelines, and cutting-edge technical principles of Digital Construction. The first half focuses on industrial criteria including 'Good Housing' policy boundaries, planning safety, architectural structures, and residential environment quality. The second half centers on forward digital collaborative design lifecycles, underlying mechanics of BIM model lightweighting, and hands-on toolchains. Competitors must accurately discern dual professional dimensions to isolate unique correct answers from highly confusing options.

Exam Format: Closed-book computer-based exam.

Question Types & Weighting: Each module is split into 'Good Housing' and 'Digital Construction' categories.

- Single-Choice: 50 questions

- Multiple-Choice: 25 questions

- True/False: 25 questions

Totaling 100 questions, 1 point per question, maximum score of 100 points.

Module 1: Single-Choice Questions(50 Questions, Total 50 Points)

Good Housing Section

1. In equipment and pipeline spacing design, which of the following techniques is highly encouraged?

- A. Concealed pipeline embedding
- B. Pipeline-structure separation technology
- C. Pipeline-through-beam routing
- D. External pipeline hanging

Answer: B

2. To achieve space flexibility and adaptability, which type of architectural layout is preferred?

- A. Small-room compartmentalized layout
- B. Large-space open layout
- C. Fixed partition wall layout
- D. Symmetrical rigid layout

Answer: B

3. For elderly-friendly and child-friendly design, when a height difference exists at the public entrance/exit of a residential building unit, what should be utilized?

- A. Standard steps
- B. Flat-slope entrances or wheelchair ramps
- C. Mechanical lifting platforms
- D. Temporary makeshift ramps

Answer: B

4. Regarding acoustic insulation and noise reduction, elevator shafts and machine rooms must not be directly adjacent to which rooms?

- A. Living rooms
- B. Bedrooms
- C. Kitchens
- D. Bathrooms

Answer: B

5. In daylighting and illumination design, what type of lighting is preferred for corridors, stairwells, and elevator halls?

- A. Artificial lighting
- B. Natural daylighting
- C. Mixed-mode illumination
- D. Emergency backup lighting

Answer: B

6. In thermal and humid environment design, the air conditioning supply vents must avoid directly facing which of the following?

- A. Windows
- B. Head of the bed
- C. Doorways

D. Wall corners

Answer: B

7. Regarding indoor air quality, what monitoring devices should be installed in the ventilation and exhaust systems of underground parking garages?

A. Temperature sensors

B. Carbon monoxide (CO) concentration monitoring devices

C. Humidity sensors

D. Smoke detectors

Answer: B

8. For water quality assurance, when the water purification process utilizes reverse osmosis (RO) membrane technology, which piping material should NOT be used downline of the purifier?

A. Stainless steel pipe

B. Copper pipe

C. PP-R pipe

D. Composite pipe

Answer: B

9. In waterproofing and moisture-proofing design, which drainage method is highly recommended for bathrooms?

A. Distinct-floor drainage (traditional drop-ceiling drainage)

B. Same-floor drainage technology

C. Outdoor drainage

D. Centralized public drainage

Answer: B

10. To prevent odor backflow and cross-contamination, what component must be installed in the ventilation/exhaust ducts?

- A. Silencer / Acoustic attenuator
- B. Fire damper and check valve
- C. Insect-proof mesh
- D. Exhaust fan

Answer: B

11. To prevent clogging and blockage, what system configuration should be deployed for ground-floor kitchens and bathrooms?

- A. Independent water supply lines
- B. Independent horizontal drainage pipes directly connected to the inspection well
- C. Boost pumps
- D. Inline filters

Answer: B

12. For thermal insulation performance, how should gaps between exterior door/window frames and the main wall structure be treated?

- A. Sealed and stuffed with cement mortar
- B. Filled and tightly packed with specialized sealing materials
- C. Filled solely with polyurethane expanding foam
- D. Wedged tight using wooden strips

Answer: B

13. For electrical energy efficiency, what control method should be adopted for public area lighting systems?

A. Manual toggle switches

B. Energy-saving controls including zoning, timers, and motion/occupancy sensors

C. Continuously active safety lighting

D. Long-range remote control

Answer: B

14. In the utilization of renewable energy, which technology application is highly encouraged?

A. Externally hung solar panels on building envelopes

B. Building-Integrated Photovoltaics (BIPV) technology

C. Rooftop micro-wind turbine power generation

D. Ground-source borehole heat exchangers

Answer: B

15. For water conservation, the water efficiency rating of sanitary fixtures should not be lower than which level?

A. Grade 1

B. Grade 2

C. Grade 3

D. Grade 4

Answer: B

16. For material conservation, which performance indicators of floors and interior walls must be enhanced?

A. Smoothness / Glossiness

B. Flatness / Planarity

C. Surface hardness

D. Water absorption rate

Answer: B

17. In smart community security setups, which system is encouraged to be implemented inside elevators?

A. Intelligent lighting adjustment system

B. Smart electric bicycle entry prohibition system

C. Smart climate control system

D. Automatic motorized curtain system

Answer: B

18. In smart parking management, what measure should be established for residential quarters with insufficient parking spaces?

A. Strict restrictions on external visiting vehicles

B. Shared parking space management measures

C. Hiking parking tariff rates

D. Complete removal of ground-level parking spaces

Answer: B

19. Regarding equipment monitoring and controls, how should public area lighting preferably be regulated?

A. Manual overriding control

B. Motion sensor control, daylight harvesting control, and time-clock scheduling

C. Remote cloud control

D. Simple countdown timer control

Answer: B

20. For operation and maintenance services, which type of digital platform is recommended to be deployed?

- A. Community group-buying commercial platform
- B. One-stop online platform for incident reporting, maintenance requests, and utility payments
- C. Social networking and entertainment platform
- D. Educational tutoring and training platform

Answer: B

21. In the foundational infrastructure of smart home ecosystems, what interfaces can be utilized as control terminals?

- A. Smartphones exclusively
- B. Smartphones, voice assistants, and localized physical control panels
- C. Voice assistants exclusively
- D. Local physical control panels exclusively

Answer: B

22. In smart home safety systems, what type of detector must be explicitly installed in kitchens?

- A. Smoke detector
- B. Combustible gas leakage detector
- C. Water logging/flood detector
- D. Ambient temperature detector

Answer: B

23. For environmental intelligence monitoring, what cluster of environmental indicators is recommended to be tracked via monitoring sensors?

- A. Temperature and humidity exclusively
- B. Temperature, humidity, PM2.5, formaldehyde, and TVOC
- C. PM2.5 particulates exclusively
- D. Formaldehyde gas exclusively

Answer: B

24. In custom smart home scenario modes, the brightness and color temperature of luminaires should be modulated dynamically according to what factor?

- A. Timeline and clock scheduling
- B. Human activity patterns and states
- C. Real-time outdoor weather variables
- D. Demographic age profiles of users

Answer: B

25. Which of the following areas does NOT belong to the 'Safety and Durability' chapter in the Guidelines?

- A. Site Safety
- B. Structural Safety
- C. Indoor Air Quality
- D. Facility and Equipment Safety

Answer: C

Digital Construction Section

1. When materials are used to form slopes on a flat roof, the slope ratio should ideally be (); when structural elements are configured to create slopes, the slope ratio should ideally be ().

- A. 1%, 2%
- B. 2%, 1%
- C. 2%, 3%
- D. 3%, 2%

Answer: C

2. For roof drainage in high-rise buildings, preference must be given to ().

- A. Internal drainage system
- B. External drainage system
- C. Unorganized/Free-fall drainage
- D. Box gutter drainage

Answer: A

3. The mass per unit volume of a material in its natural state is defined as its ().

- A. True density
- B. Apparent density
- C. Bulk density
- D. Solidity / Compactness

Answer: B

4. As the grade of hot-rolled steel reinforcing bars increases, its mechanical properties shift such that ().

- A. Yield strength increases, while ultimate strength decreases
- B. Ultimate strength increases, and ductility/plasticity increases
- C. Yield strength increases, while ductility/plasticity decreases
- D. Yield strength increases, and ductility/plasticity increases

Answer: C

5. The primary reason why marble slabs are rarely utilized for outdoor exterior decoration is that marble exhibits ().

- A. High water absorption rate
- B. Poor abrasion/wear resistance
- C. Low surface gloss retention
- D. Poor weathering and acid resistance

Answer: D

6. Which of the following items is classified as a fluid/liquid material in liquid state application?

- A. Timber veneer cladding panel
- B. Ceramic tile
- C. Surface finish putty
- D. Waterproof bituminous membrane sheet

Answer: C

7. Which of the following material options possesses a Class A fire-resistance rating (Non-combustible)?

- A. Ceramic tile
- B. Interior wallpaper
- C. Timber veneer facing
- D. Flame-retardant treated plywood board

Answer: A

8. The reaction-to-fire classification level of natural marble slabs is ().

- A. Class A

B. Class B1

C. Class B2

D. Class B3

Answer: A

9. Double-clicking on a material image within the Material Center interface allows the user to jump directly into the () interface.

A. Material Canvas Drawing

B. Material Properties Editing

C. Material Creation / Insertion

D. Material Deletion / Purging

Answer: A

10. Clicking on 'New / Create' within the Legend Center interface redirects the application to the () interface.

A. Material Matrix Assets

B. Legend Factory Engine

C. Material Center Console

D. Unit Factory Modular Engine

Answer: B

11. Which of the following methodologies does NOT belong to the block material canvas drawing techniques?

A. Product-driven asset generation

B. Path-aligned projection drawing

C. Face/Surface boundary drawing

D. Line/Edge segment drawing

Answer: D

12. Which option represents a standard drawing methodology specifically utilized for profiles/linear elements?

- A. Object-Model definition parameters
- B. Path-aligned projection drawing
- C. Face/Surface boundary drawing
- D. Line/Edge segment drawing

Answer: B

13. Which option does NOT represent a drawing methodology for fluid/liquid state finishes?

- A. Rectangular box boundary drawing
- B. Path-aligned projection drawing
- C. Face/Surface boundary drawing
- D. Stroke contour trace drawing

Answer: B

14. The 'Quick Face Split' tool is primarily deployed for laying out () to subdivide target surface boundaries without using high-fidelity solid geometries. It breaks up a face matching the layout scheme and applies the material texture. Execution path: Click Quick Face Split -> Define Dimensions -> Set Origin Direction and Start Point -> Click Complete.

- A. Linear profiles
- B. Liquid coatings / Paints
- C. Block components / Tiles
- D. Embedded steel plates

Answer: C

15. Project Definition modules natively embed National Standard Bills of Quantities (BoQ) structures across architectural decoration, MEP, landscaping, and municipal engineering fields. Which discipline explicitly requires user-defined parametric definitions prior to automatic generation of the BoQ?

- A. Core structural architecture
- B. Water supply and drainage
- C. HVAC engineering systems
- D. Interior/Exterior architectural decoration

Answer: D

16. The correct operational execution sequence for applying interior wall latex paint finish coat is ().

- A. Working from top to bottom vertically
- B. Working from bottom to top vertically
- C. Working from left to right horizontally
- D. Working from right to left horizontally

Answer: A

17. Glazed ceramic tiles are universally deployed for applications on ().

- A. Interior wall surfaces
- B. Exterior wall envelopes
- C. Both interior and exterior wall surfaces
- D. Both interior and exterior floor surfaces

Answer: A

18. In SketchUp, hitting the Spacebar key triggers which tool command by

default?

- A. Erase / Delete Tool
- B. Select / Pointer Tool
- C. Rectangle Geometries Tool
- D. Push/Pull Face Tool

Answer: B

19. To view the compiled itemized quantities of a specific component model, right-click the model selection and select () to query its cost metadata attributes.

- A. Refresh Component Attributes
- B. View Attributes Property Panel
- C. Model Structural Information
- D. Edit Component Instance

Answer: B

20. When creating architectural decoration models, mapping and defining ceramic tile properties on a wall face relies on the () function under the DFC Decorative Panel toolkit.

- A. Wall Paint Coatings
- B. Wallpapers & Coverings
- C. Wall & Column Blocks
- D. Wall & Column Surface Finishes

Answer: C

21. In the SketchUp modeling canvas, to lock a drawing inference axis or reference point, the user can hold down the () key.

- A. Shift
- B. Ctrl
- C. Alt
- D. Tab

Answer: A

22. Which of the following database parameters does NOT constitute part of a standard Itemized Work Breakdown Bill of Quantities?

- A. Work item name
- B. Project item characterization features
- C. Comprehensive detailed operational task content
- D. Quantity value and unified unit of measurement

Answer: C

23. Among the following cost categories, which one does NOT fall under the Scope of Construction Measure Project Fees?

- A. Site safety, civilized, and environmental construction measures
- B. Operational hand tools depreciation and utilization allowance
- C. Completed construction work structures and equipment asset protection fees
- D. Temporary scaffolding construction and engineering fees

Answer: B

24. Which of the following financial items is NOT classified as part of the Direct Unit Cost components of work items?

- A. Direct operational labor costs
- B. Direct material and supply costs
- C. Standard gross profit margins

D. Statutory regulatory fees / Government levies

Answer: D

25. According to uniform quantity measurement regulations, after using the 9-digit national unified code for the BoQ, supplementary project custom codes must be generated. What serial sequence must these supplementary codes begin from?

A. 0001

B. 001

C. 01

D. 1

Answer: B

Module 2: Multiple-Choice Questions (25 Questions, Total 25 Points)

Good Housing Section

1. Material durability enhancement measures comprise which of the following?

A. Deployed use of high-strength, high-performance concrete mixes

B. Selection of weather-resistant, anti-corrosion industrial coatings for metal elements

C. Selection of stain-resistant, highly weather-stable outer coatings for exterior walls

D. Selection of robust, low-maintenance finishing options for public common walls

E. Selection of heavy-duty, weather-hardy sheets for waterproofing membranes

Answer: ABCDE

2. Which statements regarding component and product assembly durability design are completely correct?

A. Exterior wall thermal insulation systems should adopt integrated structure-insulation configurations

B. Thermal insulation cores should prioritize hydrophobic/water-repellent material formulations

C. High-performance, rigorously certified architectural window and door assemblies must be specified

D. Water supply and drainage pipeline systems must select corrosion-proof, chemical-resistant products

E. Structural hardware components for doors and windows must select high wear-resistance alloy items

Answer: ABCDE

3. Engineering facilities and equipment durability assurance workflows include which of the following items?

A. Specifying high-durability, easy-to-service mechanical and electrical apparatus

B. Ensuring structural landscape facilities possess verified quality certificates

C. Implementing rigid, periodic routing inspection and preventive check regimes

D. Selecting highly resilient, abuse-resistant options for public facilities

E. Setting up structural multi-year maintenance and replacement lifecycle schedules

Answer: ABCDE

4. Spatial planning and layout criteria within residential site neighborhoods include which of the following?

- A. Rational, highly organized master planning and layout structures
- B. Architectural configurations expressing localized climate adaptations and regional cultural legacies
- C. Residential zone entrances providing seamless, high-efficiency links to public transit networks
- D. Safeguarding clear land allocations and flexibility for future public service facility expansions
- E. Actively promoting and deploying multi-level vertical mechanical parking structures

Answer: ABCDE

5. Which public supporting service facilities are actively encouraged to be established within community zones?

- A. Dedicated neighborhood meeting rooms, social lounges, and library reading hubs
- B. All-age nurseries, elderly activity spaces, and cultural arts workshops
- C. Dedicated outdoor fitness paths, running tracks, and athletic playing fields
- D. Intelligent parcel delivery lockers and thermal insulated food delivery lockers
- E. Enclosed, odor-controlled sorted waste collection stations

Answer: ABCDE

6. Which environmental layout strategies for outdoor master sites are entirely correct?

- A. Universal pedestrian sidewalk frameworks creating continuous, barrier-free

accessibility corridors

B. Converting structural stilt floors into dynamic public landscaping or community interaction hubs

C. Prioritizing native plant species that are highly adapted to the local ecosystems

D. Engineering functional rain gardens, bioswales, and sunken bio-retention green belts

E. Deploying smart nighttime ambient lighting with precise angle controls and dimming functions

Answer: ABCDE

7. All-age friendly design design specifications encompass which of the following measures?

A. Walkway dimensions and gradients systematically designed to facilitate wheelchair navigation

B. Grouping children's play areas adjacent to elderly passive recreation zones

C. Laying impact-absorbing elastic soft safety surfaces across children's playgrounds

D. Installing continuous, robust structural grab rails and handrails at elderly zones

E. Providing independent, universal family-inclusive gender-neutral restroom units

Answer: ABCDE

8. Which of the following implementation criteria for community wayfinding and signage systems are fully correct?

A. Signage and wayfinding systems must undergo dedicated professional specialty design workflows

B. Installing high-definition neighborhood master plans at main community entrances/exits

C. Ensuring building identity number plates are backlit or visible under night conditions

D. Etching high-visibility anti-collision warnings and visual indicators across large glass doors

E. Specifying flame-retardant, retroreflective materials for emergency evacuation signage

Answer: ABCDE

9. Which public common area design and layout treatments are entirely correct?

A. Main building entrance foyers should feature integrated neighborhood social lounges

B. Every building unit core must feature vertical elevator links reaching subterranean parking levels

C. Mounting impact-absorbing safety corner guards on all sharp columns in underground garages

D. Sizing electronic information displays so they do not encroach upon evacuation exit widths

E. Maintaining level, non-slip, and slip-resistant floor treatments across public circulation spaces

Answer: ABCDE

10. Layout optimization measures for private residential apartment layouts

comprise which options?

- A. Creating rectangular, highly regular layouts while eliminating skewed geometries
- B. Designing an independent, distinct foyer entry threshold zone upon entry
- C. Drawing clear demarcations between active living zones and quiet bedroom quarters
- D. Encouraging the configuration of functional balconies and dedicated utility storage rooms
- E. Guaranteeing ample exposure to natural daylight harvesting and cross-ventilation airflows

Answer: ABCDE

11. Which specifications regarding structural kitchen and bathroom space designs are completely correct?

- A. Pre-allocating structural spatial footprints and utilities for dishwashers and waste disposers
- B. Configuring bathrooms to separate dry vanity areas from wet bathing cubicles
- C. Mounting mechanical fire-rated non-return check valves on kitchen range hood exhaust flues
- D. Selecting heavy-duty floor tiles possessing excellent non-slip safety coefficients
- E. Specifying seamless, chemical-resistant, and easily cleanable materials for worktops

Answer: ABCDE

12. Spatial organization guidelines for residential storage design comprise which

of the following?

A. Setting up specialized storage capacities custom-tailored to individual functional rooms

B. Capitalizing on structural corners and residual alcove spaces to generate extra storage volume

C. Utilizing fully adjustable interior shelving brackets within modular storage cabinets

D. Adjusting storage heights to protect safety, accessibility, and ergonomic use by seniors

E. Pre-allocating dedicated volumetric footprints for bulky suitcases and baby strollers

Answer: ABCDE

13. Which design choices regarding building equipment and pipeline space management are completely correct?

A. Implementing high-density integrated routing design for all equipment pipelines

B. Actively adopting pipeline-structure separation technology throughout construction

C. Sizing utility service access hatches to fully accommodate practical maintenance tools

D. Organizing pipeline layouts to facilitate hassle-free future upgrades and modular extraction

E. Implementing precise construction tolerances and strict quality monitoring on site

Answer: ABCDE

Digital Construction Section

1. Which of the following glass types belong to the safety glass classification group?

- A. Fully tempered thermal-toughened glass
- B. Surface-coated energy control glass
- C. Double-glazing sealed insulating glass units
- D. Deep-etched decorative glass sheets
- E. Multi-layer polymer laminated safety glass

Answer: AE

2. Validated structural methods for connecting steel reinforcing bars in structural concrete works include ().

- A. High-heat fusion welding techniques
- B. Manual iron wire lap-binding connections
- C. Mechanical coupler splicing sleeve connections
- D. High-strength bolt fastening assemblies
- E. Heavy industrial riveting structural connections

Answer: ABC

3. According to the 'Code of Valuation with Bill of Quantities for Construction Engineering' (GB-50500-2013), which statements regarding the compiling of itemized work quantities are correct?

- A. For work items quantified by weight metrics, the unit of measure must be tons or kilograms

B. When adopting tons as the weight unit, the calculated quantity values must be rounded to three decimal places

C. When adopting cubic meters as the volumetric unit, the final calculated values must be rounded to three decimal places

D. When adopting kilograms as the weight unit, the calculated quantity values must be rounded to one decimal place

E. For items measured using discrete counts like 'Unit', 'Set', or 'Project', values must be integers

Answer: ABE

4. Under enterprise construction qualification frameworks, which field management personnel must hold formal regulatory certifications?

A. Construction field execution engineers (Site Managers)

B. Regulatory field safety officers

C. Certified field electrical technicians

D. Heavy mechanical plant operators

E. Project cost estimation professionals (Quantity Surveyors)

Answer: ABE

5. In SketchUp, the Freehand Line drawing tool is universally applied across which modeling actions?

A. Tracing landscape contour lines and topographic curves

B. Drawing custom decorative patterns or organic profiles

C. Drafting organic tree silhouettes and foliage outlines

D. Canvas sketching of wall mural artworks

E. Free-hand conceptual drafting and artistic ideation

Answer: ABCDE

6. Which of the following tools represent standard wall drawing options in the BIM design module?

- A. Direct line segment coordinate tracing
- B. Marquee box selection window generation
- C. Inputting explicit core wall thickness dimensions
- D. Object edge picking and automated generation
- E. Structural grid column insertion tool

Answer: ACE

7. The DFC Secondary Structure module is capable of modeling which structural components?

- A. Structural tie/confinement columns (Structural Columns)
- B. Horizontal continuous ring beams (Bond Beams)
- C. Door and window opening structural lintels
- D. Reinforced concrete window sill cast-in-place slabs
- E. Bathroom base waterproofing concrete upstands (Kicker curbs)

Answer: ABCDE

8. When deploying DFC tools to sketch external steps or access ramps, right-clicking the canvas invokes contextual shortcuts to do what?

- A. Toggle/Cycle the active alignment insertion base point
- B. Invert/Reverse the drawing direction layout orientation
- C. Force-snap alignment matching the global X-axis coordinate
- D. Force-snap alignment matching the global Y-axis coordinate
- E. Force-snap alignment matching the global Z-axis coordinate

Answer: ABCD

9. Standard downstream outputs directly compiled and exported from the DFC system environment include ().

- A. Standardized engineering Itemized Bills of Quantities (BoQ)
- B. Structural procurement specifications and Material White Papers
- C. Complete packages of 2D engineering construction drawings
- D. Digital manufacturing-ready Bill of Materials (BOM) asset databases
- E. Multi-disciplinary itemized inventory material lists

Answer: ABCDE

10. Which of the following operations accurately represent the functional logic of the SketchUp Push/Pull tool?

- A. Double-clicking a newly created extruded face applies an identical extrusion distance step to multiply geometry
- B. Double-clicking sequentially on multiple separate faces extrudes all of them to match the exact dimensions of the initial extrusion
- C. Executing a push/pull on a front face and double-clicking a back face creates an extrusion running in an identical vector direction
- D. Tapping the Ctrl key during a push/pull creates a face duplicate to segment the extrusion path
- E. Tapping the Alt key during a push/pull copies the extrusion profile across alternative paths

Answer: ABD

11. Which statements regarding geometric duplication operations within the SketchUp workspace are fully correct?

A. Holding down the Alt key while performing an object relocation with the Move tool creates a duplicate

B. Holding down the Ctrl key while running a rotation sequence with the Rotate tool creates a duplicate instance

C. Utilizing standard Ctrl+C keyboard inputs followed by Ctrl+V commands replicates target geometries

D. Utilizing the Push/Pull tool allows continuous stacked duplications along an extrusion axis

E. Using the Offset tool enables concentric scaled duplication of closed boundary edges

Answer: BCDE

12. In which of the following technological domains can SketchUp workflows be comprehensively deployed?

A. 3D laser scanning, 3D printing fabrication, prefabricated interior design, and modular MEP assemblies

B. Cost estimation, itemized production cutting schedules, transit logistics simulation, and construction sequence simulation

C. Urban planning master design, core architecture, interior architecture, concept schematics, and reverse engineering modeling

D. 2D detailing, construction documentation, visual progress tracking, assembly sequencing, and multi-service clash coordination

E. Cloud-based collaborative BIM design, landscape architecture, and interactive building walk-through flyovers

Answer: ABCDE

13. The standard orthographic and projection viewport types natively built into SketchUp include which options?

- A. Top projection view
- B. Left orthographic profile view
- C. Rear orthographic facade view
- D. Perspective projection view
- E. Right orthographic profile view

Answer: ABCE

Module 3: True or False Questions

(25 Questions, Total 25 Points)

Good Housing Section

1. Potable drinking water storage tanks are completely exempt from incorporating dedicated sanitization or disinfection apparatus. (False)
2. Every electrical socket outlet installed within residential spaces must incorporate residual current leakage protection devices and internal mechanical safety shutters. (True)
3. Electrical socket outlets deployed inside wet bathroom domains can be installed without splash-proof protective enclosures. (False)
4. Cooking gas ranges and stoves must feature integrated flame-failure safety protection cutout valves. (True)
5. During a grid power outage, passenger elevators are not required to feature automated rescue devices to drift and stop at the nearest floor line. (False)

6. The interior decorative linings of elevator cars should exclusively utilize flame-retardant, eco-friendly material selections. (True)

7. Exterior wall finish coatings can specify standard interior grades, without needing stain-resistant or high weatherability properties. (False)

8. All integrated water supply and drainage pipeline systems must select products that possess robust corrosion resistance and long-term anti-aging characteristics. (True)

9. Residential compound entry checkpoints are completely exempt from establishing physical infrastructure connections to urban public transport stations. (False)

10. It is highly encouraged to convert building stilt floors into multi-functional neighborhood lounges, social meeting zones, and library reading alcoves. (True)

11. Landscaping flora planted inside children's dedicated play areas can include plant species featuring sharp thorns or toxic berries. (False)

12. Recreation and social spaces dedicated to senior citizens must install continuous, firmly anchored structural grab rails and safety handrails. (True)

Digital Construction Section

1. A primary defining chemical characteristic of slag Portland cement is its superior water impermeability and resistance to hydrostatic pressure. (False)

2. The structural skeleton system of a building bears both vertical dead/live loads and lateral wind/seismic forces, safely transferring them down to the foundation soil. (True)

3. The DFC toolkit enables users to parse structural beam parameters by beam

classification, tag numbers, concrete strength grades, elevation levels, cross-section sizes, spans, and volumes to generate structured data schedules and direct Excel exports. (True)

4. According to construction drawing standards, the uniform notation designation for a horizontal beam side-haunch is 'Y', whereas the notation for a vertical depth-haunch is 'PY'. (False)

5. The DFC application environment fully supports the modeling of all architectural components using parametric object-model definition methodologies. (True)

6. DFC enables multi-object selection and global batch editing to apply uniform offset height corrections, but completely blocks modifications to material metadata properties. (False)

7. Within the DFC canvas, double-clicking a wall model instance brings up the editing context toolbar, which contains dedicated functionalities to split or disconnect wall segments. (True)

8. When tracing wall vectors using DFC tools, any intersection where a wall crosses structural columns, beams, or floor slabs triggers automated geometric trim and profile cutting routines. (True)

9. The execution workflow of the DFC marquee-box selection window tool for automatic slab generation is designed to be deployed across flat plate configurations lacking supporting beams (Beamless slabs). (False)

10. The DFC structural confinement column tool is completely unable to generate interlocking stepped masonry block profiles (Toothing connections / 'Ma-Ya-Cha'). (False)

11. Wall opening workflows in DFC force users to cut openings directly on wall or slab object properties; it is impossible to draft an opening layout patch using generic SketchUp faces to generate an opening via edge picking. (False)

12. DFC door, window, and wall opening placement tools support the simultaneous generation of auxiliary secondary structural trims, including lintels and confinement tie columns. (True)

13. The DFC door and window placement tool is completely unable to intercept and read raw opening dimensions to automatically scale and generate door or window models. (False)

Part II: Practical Part

Task Overview:

Based on the DFC Digital Construction Platform, this practical assessment tests competencies across six core integrated modules: AI Schematic Design, Lightweight Performance Modeling, Cloud-Based Collaborative Design, Cost Engineering Design, Model-Driven Construction Documentation, and Material Inventory Ingestion & Utilization. Competitors must execute specified CAD/BIM tasks within the designated timeframe, compiling and uploading model files, sheets, high-fidelity images, and spreadsheet schedules. The competition evaluates comprehensive mastery over core DFC modules and lifecycle execution capacities in digital engineering.

Exam Format:

Hands-on on-machine operations + Cloud collaboration platform live tasks.

Module 1: AI Schematic Design

Description: This module utilizes the DFC native Generative AI engine. The user interface embeds core feature modules including 'Inspiration Exploration', 'High-Fidelity Rendering', 'Localized Inpainting & Editing', 'Style Transfer Reference', 'Model Asset Libraries', and 'Cinematic Scene Staging'. Competitors must precisely leverage corresponding features to fulfill design criteria.

Task 1: High-Fidelity Rendering + Asset Library Utilization

(9 Points)

- Skills Target: High-quality photorealistic rendering, smart interior furniture layout configuration.

- Task Brief: An un-furnished structural interior shell model is provided. Competitors must navigate to 'Model Asset Libraries' -> 'Furniture Library' to populate the space with at least 5 distinct furniture objects (e.g., sofas, coffee tables, dining tables, beds), maintaining rigorous functional layout logic. Then, trigger 'High-Fidelity Rendering' to compile a high-resolution interior rendering (minimum resolution 1920x1080, rendering quality set to Max). Toggle on 'Ray-Tracing Optimization' under 'Cinematic Scene Staging' if available.

- Input Asset: Materials/Empty_Interior_Shell.skp (or local application preset model)

- Deliverables: Populated model file: 1.2_CompetitorID_Layout.skp (Optional);
Compiled high-fidelity image: 1.2_CompetitorID_Render.jpg

- Evaluation Rubric:

Populating ≥ 5 furniture items with solid layout logic (3 pts, 0.6 pts/item);

Correct execution of High-Fidelity Rendering under max quality (6 pts);

Image clarity, realistic global illumination, noise-free outputs (3 pts);

Successful activation of Cinematic Scene Staging parameters (3 pts).

Task 2: Localized Inpainting & Cinematic Staging (9 Points)

- Skills Target: Localized geometric modification of compiled images, background environment swapping.

- Task Brief: Leverage the high-fidelity rendering compiled in Task 1. Use the 'Localized Inpainting & Editing' brush tool to change the color of the sofa to specified blue, and swap out the coffee table decorative items with an alternate prop array from the asset library. Then use 'Cinematic Scene Staging' to swap the exterior background

window view into a 'Metropolitan Nightscape' or 'Ocean Horizon'. Re-generate the final edited image asset.

- Input Asset: Output rendering from Task 1, or provided file Materials/Reference_Render.jpg

- Deliverables: Final processed rendering asset: 1.3_CompetitorID_FinalEdit.jpg;
UI step capture (Optional, for arbitration verification).

- Evaluation Rubric:

 - Sofa color transformation executed seamlessly matching scene lighting (3 pts);

 - Table decoration swapping executed cleanly (3 pts);

 - Exterior view swapping executed with high blending accuracy (3 pts).

Module 2: Lightweight Performance Modeling

Task 3: Architecture Finish Layer Boundary Modeling (16 Points)

- Skills Target: Automation generation of interior finishes, material asset mapping.

- Task Brief: Based on the provided dimensional 2D room layout plan, deploy finish generation tools to trace and generate distinct ground finish layers and wall finish faces. Map specified material parameters to components (Flooring: Ceramic Floor Tiles; Walls: Interior Latex Paint).

 - Input Asset: Materials/Room_Layout_Plan.dwg

 - Deliverables: Compiled BIM model file: 2.3_CompetitorID_Finishes.skp;
Canvas view image export: 2.3_CompetitorID_FinishesView.jpg

- Evaluation Rubric:

Ground finish layers generated with perfect boundary accuracy (6 pts);

Wall finish faces generated cleanly matching vertical limits (6 pts);

Material asset mapping perfectly matched to specification parameters (6 pts).

Module 3: Cloud-Based Collaborative Design

Special Condition: Live cloud execution on the DFC Collaboration Platform. Competitors will be provisioned unique cloud credentials before launch. Target workspaces and baseline federation models are pre-staged.

Crucial Continuity Note: This module is a multi-step sequence. Competitors must execute model federation in Regional Selection first, and then conduct design review coordination directly on their self-compiled federated model version. The system auto-logs versions; reviews must be bound to the verified federated instance.

Task 4: Collaborative Design Review Coordination &

Annotation (20 Points)

- Skills Target: Federated model coordination, issue annotation tagging, task assignment, coordination report generation.

- Task Brief: Access your compiled federated model within the cloud platform workspace. Create and submit at least 3 distinct design coordination issues. The issue matrix must contain: at least 1 MEP-structural pipeline clash issue, 1 dimensional layout error issue, and 1 material asset omission issue. Each issue entry must populate: 3D spatial marker pin, descriptive text log, and designated task owner assignment (e.g., Engineer Zhang).

- Input Asset: Self-compiled federated model instance.

- Deliverables: Consolidated Design Review Coordination PDF Report:

3.2_CompetitorID_CoordinationReport.pdf; Marquee screen capture of a sample issue pin: 3.2_CompetitorID_IssuePinSample.jpg

- **Evaluation Rubric:**

Compilation of 3 valid coordination issues (6 pts, -2 pts per omitted entry);

Issue matrix covers all 3 specified issue types (6 pts, 2 pts per type);

Clear issue documentation with precise spatial tracking (4 pts);

Successful generation and export of the official coordination PDF report (4 pts).

- Emergency Fallback: If model federation fails completely, competitors can request a baseline fallback model to proceed with Task 4.

Module 4: Cost Engineering Design

Note: Independent localized models are provided for each task.

Task 5: Bill of Quantities Automation Compiling (6 Points)

- Skills Target: Automated extraction of architectural quantities.

- Task Brief: Based on the provided rooms-finishes model, trigger the cost extraction engine to automatically compile an itemized Bill of Quantities tracking wall finish areas, ground flooring areas, and baseboard linear lengths.

- Input Asset: Materials/Room_Finishes_Model.skp

- Deliverables: Exported Excel BoQ file spreadsheet:

4.2_CompetitorID_BoQ.xlsx

- Evaluation Rubric: Accuracy of compiled wall finish surface area quantities (2 pts);

Accuracy of compiled floor finish area quantities (2 pts);

Accuracy of compiled baseboard linear length quantities (2 pts).

Task 6: Bill of Materials (BOM) Component Ingestion (6 Points)

- Skills Target: Ingestion of object components and specifications.

- Task Brief: Evaluate the provided architectural layout containing interior door/window assemblies and plumbing sanitary fixtures. Extract and compile a comprehensive manufacturing-ready Bill of Materials inventory charting object names, model specifications, and absolute item counts.

- Input Asset: Materials/Fixtures_Schematic_Model.skp

- Deliverables: Exported Excel BOM inventory spreadsheet:

4.3_CompetitorID_BOM.xlsx

- Evaluation Rubric: Object name mapping integrity across all architectural fixtures (2 pts);

Precision tracking of model specifications parameters (2 pts);

Absolute counting accuracy of fixture instances (2 pts).

Module 5: Model-Driven Construction

Documentation

Task 7: Automated Engineering Construction Sheet

Production (17 Points)

- Skills Target: Generating 2D sheets from 3D model data.
- Task Brief: Based on the verified structural architecture model from previous stages, deploy documentation engines to generate 2D construction drawings. Produce 1 floor plan view sheet, 1 interior wall elevation sheet, 1 detailed section detail sheet, and 1 reflected ceiling plan (RCP) sheet. Compile and export the entire drawing set as a multi-layered CAD file format.
- Input Asset: Materials/Documentation_Base_Model.skp
- Deliverables: Vector CAD drawing set package file:
5.2_CompetitorID_CD.DWG
- Evaluation Rubric: Floor plan drawing layout generation and annotations accuracy (5 pts);
Wall elevation drawing scaling and profiles accuracy (4 pts);
Detailing sheet construction assembly logic (4 pts);
Reflected ceiling plan components coordination accuracy (4 pts).

Module 6: Material Inventory Ingestion & Utilization

Task 8: Object Asset Ingestion Call & Property Validation

(17 Points)

- Skills Target: Component asset injection, object metadata validation workflows.
- Task Brief: Query the active project cloud library to retrieve the cataloged fire-rated door assembly asset. Instantiate and place this assembly object into the designated structural rough opening layout of the active model space. Open the attribute dashboard to verify the accuracy of embedded property fields (Model Number, Structural Dimensions, and Fire-Resistance Rating).
 - Input Asset: Materials/Wall_With_Openings.skp (Opening footprints pre-matched to target asset profiles)
 - Deliverables: Populated model file assembly:
6.2_CompetitorID_AssetPlaced.skp;
Marquee capture of object properties panel validation view:
6.2_CompetitorID_PropertyValidation.jpg
 - Evaluation Rubric: Successful cloud extraction and instantiation of specified door component asset **(4 pts)**;
Flush alignment and orientation matching rough opening boundaries **(4 pts)**;
Metadata properties panel verification tracking: Model Number verification **(3 pts)**,
Dimensional data validation **(3 pts)**,
Fire classification validation **(3 pts)**.

