

# TQUK Level 3 Certificate in Design, Engineer, Construct: The Digital Built Environment (RQF) (603/2052/7)

Paper ID: KNIL - 10 Certificate

Assessment date: PASTPAPER1

## Mark Scheme

### Mark scheme information

This mark scheme is intended to support the valid and consistent marking of the examination paper identified above. This mark scheme includes:

- the total mark available for each question
- the individual subject content coverage of each question
- further considerations which could or should be followed.

### Information for the marker

- All marking **must** be completed consistently and applied fairly
- Markers should award full marks if the candidate deserves full marks
- Markers should be prepared to award zero marks if the candidate's response is not worthy of credit according to the guidance for that activity
- Crossed-out work should be marked unless the candidate has replaced it with an alternative response
- There are **no** marks for spelling, punctuation and grammar in the Reading papers; therefore, errors are **not** penalised
- Unless indicated, quotations and candidates' own words are acceptable.

### Key

SC	Subject Content Coverage (as identified in the Qualification Specification)
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Text in brackets	May be included but is not essential to be awarded the mark
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Marking Term	Definition
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(CAO)	Mark awarded for a correct answer only
(FT)	Follow-through marks are applied when there are earlier mistakes in the method. The candidate should <b>not</b> be penalised.
(M)	Method mark awarded for application of a correct method.

**Grade boundaries:**

<b>E</b>	<b>37</b>
<b>D</b>	<b>48</b>
<b>C</b>	<b>59</b>
<b>B</b>	<b>72</b>
<b>A</b>	<b>83</b>
<b>A*</b>	<b>94</b>

Q	Answer	Marks	SC
1a	<p><i>Identify <b>one</b> element that should be included in a mission statement.</i></p> <p>Award <b>1 mark</b> for a correct element. For example:</p> <ul style="list-style-type: none"> <li>• purpose (1) / vision (1) <ul style="list-style-type: none"> <li>○ purpose statement (1)</li> <li>○ vision statement (1)</li> </ul> </li> <li>• core values (1) <ul style="list-style-type: none"> <li>○ sustainability (1)</li> <li>○ quality (1)</li> <li>○ safety (1)</li> <li>○ integrity and ethics (1)</li> </ul> </li> <li>• commitment to clients (1) <ul style="list-style-type: none"> <li>○ customer satisfaction (1)</li> <li>○ innovation (1)</li> <li>○ timeliness and budget (1)</li> </ul> </li> <li>• community and social responsibility (1) <ul style="list-style-type: none"> <li>○ community engagement (1)</li> <li>○ social responsibility (1)</li> </ul> </li> <li>• employee focus (1) <ul style="list-style-type: none"> <li>○ employee development (1)</li> <li>○ teamwork (1)</li> </ul> </li> <li>• innovation and continuous improvement (1) <ul style="list-style-type: none"> <li>○ continuous learning (1)</li> <li>○ innovation. (1)</li> </ul> </li> </ul> <p>Accept any other suitable response.</p>	1	1.1.5

Q	Answer	Marks	SC
1b	<p><i>What does 'ethical sourcing' mean?</i></p> <p>Award <b>1 mark</b> for a correct definition. For example:</p> <ul style="list-style-type: none"> <li>• ensuring products / materials are obtained in a responsible manner (1) considering the environmental / social / economic impacts of the sourcing process (1)</li> <li>• a process that uses fair trader practices (1)</li> <li>• a process that uses fair trade practices (1)</li> <li>• a process that minimises environmental harm. (1)</li> </ul> <p>Accept any other suitable response.</p>	1	1.2.4

Q	Answer	Marks	SC
1c (i)	<p><i>What does ‘sustainability monitoring and reporting procedures’ for the lifecycle of the project mean?</i></p> <p>Award <b>1 mark</b> for a correct definition. For example:</p> <ul style="list-style-type: none"> <li>continuous tracking / assessment / reporting of a project’s environmental, social, and economic impacts, from its inception through to its completion and beyond / BREEAM rating / reputation (1)</li> </ul> <p>Accept any other suitable response.</p>	1	1.2.5

Q	Answer	Marks	SC
1c (ii)	<p><i>State a benefit of ‘sustainability monitoring and reporting procedures’ on the lifecycle of a construction project.</i></p> <p>Award <b>1 mark</b> for a correct benefit. For example:</p> <ul style="list-style-type: none"> <li>ensures the project aligns with sustainability goals (1)</li> <li>ensures a project adapts to challenges (as they arise). (1)</li> </ul> <p>Accept any other suitable response.</p>	1	1.2.5

Q	Answer	Marks	SC
1d	<p>Identify <b>two</b> ways an eco-building project team could commit to minimising construction waste.</p> <p>Award <b>1 mark</b> for <b>each</b> response, up to a maximum of <b>2 marks</b>. Answers must be specific. For example:</p> <ul style="list-style-type: none"> <li>● design for deconstruction (1) / reuse (1) <ul style="list-style-type: none"> <li>○ modular construction (1)</li> <li>○ material selection (1)</li> </ul> </li> <li>● efficient material management (1)t <ul style="list-style-type: none"> <li>○ accurate material estimation (1)</li> <li>○ just-in-time delivery (1)</li> <li>○ material segregation (1)</li> </ul> </li> <li>● on-site waste reduction practices <ul style="list-style-type: none"> <li>○ waste audits (1)</li> <li>○ on-site recycling facilities (1)</li> <li>○ waste reduction targets (1)</li> </ul> </li> <li>● off-site construction) <ul style="list-style-type: none"> <li>○ prefabrication (1)</li> <li>○ lean construction techniques (1)</li> </ul> </li> <li>● sustainable procurement practices <ul style="list-style-type: none"> <li>○ local sourcing (1)</li> <li>○ eco-friendly materials (1)</li> </ul> </li> <li>● education and training <ul style="list-style-type: none"> <li>○ worker training (1)</li> <li>○ awareness programmes (1)</li> </ul> </li> <li>● implementing circular economy principles <ul style="list-style-type: none"> <li>○ material reuse (1)</li> <li>○ cradle-to-cradle design. (1)</li> </ul> </li> </ul> <p>Accept any other suitable response.</p>	2	1.2.3

Q	Answer	Marks	SC
2a (i)	<p>Identify <b>one positive</b> and <b>one negative</b> of using larch for an eco-house construction.</p> <p>Award <b>1 mark</b> for a <b>positive</b> of using larch for an eco-house construction. Answers must be specific. For example:</p> <ul style="list-style-type: none"> <li>• durability (1) <ul style="list-style-type: none"> <li>○ natural resistance (1) (larch wood is naturally resistant to decay and insect attacks, making it a durable choice for both structural and external applications)</li> <li>○ longevity (1) (its resistance to weathering and rot means that larch can have a long lifespan, especially when used in outdoor settings like decking, cladding, and fencing)</li> </ul> </li> <li>• strength (1) <ul style="list-style-type: none"> <li>○ load-bearing capacity (1) (larch has a good strength-to-weight ratio, making it suitable for structural elements such as beams, posts, and supports)</li> <li>○ stability (1) (it performs well in varying conditions and is less likely to warp or twist compared to some other softwoods)</li> </ul> </li> <li>• aesthetic appeal (1) <ul style="list-style-type: none"> <li>○ appearance (1) (larch has a warm, rich colour with a distinctive grain pattern that can enhance the visual appeal of a building. It often develops a silvery patina over time if left untreated)</li> <li>○ workability (1) (it is relatively easy to work with, including sawing, sanding, and finishing, allowing for a variety of design options)</li> </ul> </li> <li>• environmental considerations (1) <ul style="list-style-type: none"> <li>○ sustainability (1) (larch is often sourced from sustainably-managed forests, especially in European and North American regions. Look for certification to ensure responsible sourcing.)</li> </ul> </li> </ul> <p>Award <b>1 mark</b> for a <b>negative</b> of using larch for an eco-house construction. For example:</p> <ul style="list-style-type: none"> <li>• cost (1) <ul style="list-style-type: none"> <li>○ price (1) (larch can be more expensive than some other softwoods like pine or spruce. Its higher cost may be due to its durability and aesthetic qualities)</li> </ul> </li> <li>• moisture sensitivity (1) <ul style="list-style-type: none"> <li>○ shrinkage and swelling (1) (whilst larch is resistant to decay, it can still experience some movement with changes in moisture content, leading to potential shrinkage or swelling if not properly treated or managed)</li> </ul> </li> <li>• maintenance (1) <ul style="list-style-type: none"> <li>○ weathering (1) (although larch is resistant to decay, it can weather over time if exposed to the elements. This natural weathering process can lead to colour changes and surface degradation, which may require maintenance or treatment to preserve its appearance)</li> </ul> </li> <li>• availability (1)</li> </ul>	2	3.1.2

	<ul style="list-style-type: none"> <li>○ supply (1) (depending on your location, larch might not be as readily available as other softwoods. This could affect procurement and lead times for construction projects)</li> <li>● knots (1) <ul style="list-style-type: none"> <li>○ appearance (1) (larch can contain knots, which may be a concern in applications where a smooth, knot-free surface is desired. Knots can also affect the wood's strength and workability.)</li> </ul> </li> </ul> <p>Accept any other suitable response.</p>		
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Past paper

Q	Answer	Marks	SC
2a (ii)	<p>Identify <b>one positive</b> and <b>one negative</b> of using oak for an eco-house construction.</p> <p>Award <b>1 mark</b> for a <b>positive</b> of using oak for an eco-house construction. Answers must be specific. For example:</p> <ul style="list-style-type: none"> <li>● strength and durability (1) <ul style="list-style-type: none"> <li>○ high strength (1) (oak is renowned for its strength and robustness, making it an excellent choice for structural elements such as beams, joists, and posts))</li> <li>○ longevity (1) (oak is naturally durable and resistant to wear and tear, which contributes to a long lifespan in construction applications)</li> </ul> </li> <li>● aesthetic appeal (1) <ul style="list-style-type: none"> <li>○ rich appearance (1) (oak has a distinctive grain pattern and rich colour that can add elegance and warmth to both interior and exterior elements)</li> <li>○ finishing (1) (it responds well to various finishing treatments, including staining and varnishing, which can enhance its natural beauty)</li> </ul> </li> <li>● versatility (1): <ul style="list-style-type: none"> <li>○ applications (1) (oak is suitable for various applications, including flooring, cabinetry, furniture, and structural elements. Its versatility makes it a popular choice in multiple construction and design contexts (1)</li> </ul> </li> <li>● workability (1) <ul style="list-style-type: none"> <li>○ ease of use (1) (whilst oak is a hardwood, it is relatively easy to work with compared to some other hardwoods, allowing for detailed carving and precision in joinery)</li> <li>○ historical significance (1)</li> <li>○ tradition (1) (oak has been used in construction for centuries, providing a sense of historical continuity and traditional craftsmanship)</li> </ul> </li> <li>● fire resistance (1) <ul style="list-style-type: none"> <li>○ natural resistance (1) (oak has better fire resistance compared to some other timbers, which can enhance the fire safety of buildings.)</li> </ul> </li> </ul> <p>Award <b>1 mark</b> for a <b>negative</b> of using oak for an eco-house construction. For example:</p> <ul style="list-style-type: none"> <li>● cost (1) <ul style="list-style-type: none"> <li>○ expense (1) (oak is generally more expensive than other types of timber, such as softwoods or less durable hardwoods. This higher cost can impact the overall budget of a construction project)</li> </ul> </li> <li>● weight (1) <ul style="list-style-type: none"> <li>○ heaviness (1) (oak is a heavy timber, which can make it more challenging to handle and transport. This can also impact the structural load and require more robust supporting elements)</li> </ul> </li> <li>● moisture sensitivity (1)</li> </ul>	2	3.1.2

	<ul style="list-style-type: none"> <li>○ movement (1) (oak can expand and contract with changes in moisture content, which may lead to warping or splitting if not effectively managed. Ensuring adequate treatment and sealing is essential)</li> <li>● environmental impact (1) <ul style="list-style-type: none"> <li>○ sourcing concerns (1) (oak is a slow-growing species and can be subject to overharvesting. It is important to source oak from sustainably managed forests to mitigate environmental impact)</li> </ul> </li> <li>● maintenance (1) <ul style="list-style-type: none"> <li>○ ongoing care (1) (oak can require ongoing maintenance, such as periodic sealing or refinishing, to maintain its appearance and durability, especially in exterior applications)</li> </ul> </li> <li>● knots and imperfections (1) <ul style="list-style-type: none"> <li>○ aesthetic issues (1) (oak can contain knots and imperfections, which might be undesirable in applications where a perfectly smooth surface is needed. These features can also affect the strength and workability of the wood)</li> <li>○ acidic, requires specific fixing materials, not ferrous 1000</li> </ul> </li> </ul> <p>Accept any other suitable response.</p>		
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Q	Answer	Marks	SC
2a (iii)	<p>Identify <b>one positive</b> and <b>one negative</b> of using bamboo for an eco-house construction.</p> <p>Award <b>1 mark</b> for a <b>positive</b> of using bamboo for an eco-house construction. Answers must be specific. For example:</p> <ul style="list-style-type: none"> <li>● sustainability (1) <ul style="list-style-type: none"> <li>○ rapid growth (1) (bamboo grows incredibly fast, with some species reaching maturity in 3-5 years, making it a highly renewable resource compared to traditional timber)</li> <li>○ low carbon footprint (1) (bamboo absorbs substantial amounts of carbon dioxide during its growth, contributing to a lower carbon footprint)</li> </ul> </li> <li>● strength and durability (1) <ul style="list-style-type: none"> <li>○ high strength (1) (bamboo has a high strength-to-weight ratio, making it suitable for structural applications. It is often stronger than many hardwoods and softwoods in terms of tensile strength)</li> <li>○ flexibility (1) (its natural flexibility makes it resistant to impact and seismic forces, beneficial for regions prone to earthquakes)</li> </ul> </li> <li>● versatility (1) <ul style="list-style-type: none"> <li>○ applications (1) (bamboo can be used in a wide range of construction applications, including flooring, scaffolding, structural supports, and even as a replacement for traditional timber in some cases)</li> <li>○ design flexibility (1) (its unique appearance allows for innovative and aesthetically-pleasing design options)</li> </ul> </li> <li>● environmental benefits (1) <ul style="list-style-type: none"> <li>○ soil erosion control (1) (bamboo's extensive root system helps prevent soil erosion and can improve soil health)</li> <li>○ biodiversity (1) (bamboo forests support diverse ecosystems and provide habitat for various species)</li> </ul> </li> <li>● low processing energy (1) <ul style="list-style-type: none"> <li>○ minimal processing (1) (bamboo often requires less energy to process compared to traditional timber, making it an eco-friendlier in terms of production.)</li> </ul> </li> </ul> <p>Award <b>1 mark</b> for a negative of using bamboo for an eco-house construction. For example:</p> <ul style="list-style-type: none"> <li>● moisture sensitivity (1) <ul style="list-style-type: none"> <li>○ water absorption (1) (bamboo can be sensitive to moisture and prone to swelling or shrinking with changes in humidity. This can lead to issues like warping or cracking if not properly treated)</li> </ul> </li> <li>● durability concerns (1) <ul style="list-style-type: none"> <li>○ pest and decay (1) (untreated bamboo can be susceptible to insect infestation and decay. It typically requires treatment to enhance its durability and resistance to pests)</li> </ul> </li> <li>● quality variation (1)</li> </ul>	2	3.1.2

	<ul style="list-style-type: none"> <li>○ inconsistency (1) (the quality of bamboo can vary widely depending on the species and processing methods. This can impact its strength and suitability for different construction applications)</li> <li>● limited availability (1) <ul style="list-style-type: none"> <li>○ regional constraints (1) (while bamboo is widely available in some regions (like Asia), it may be less accessible in others, potentially affecting supply and cost)</li> </ul> </li> <li>● building codes and standards (1) <ul style="list-style-type: none"> <li>○ regulatory challenges (1) (bamboo construction might face challenges with building codes and standards in some regions. Its use may be limited by local regulations or require additional testing and certification)</li> </ul> </li> <li>● maintenance (1) <ul style="list-style-type: none"> <li>○ ongoing care (1) (bamboo structures often require regular maintenance to ensure longevity and to address potential issues with pests or environmental exposure.)</li> </ul> </li> </ul> <p>Accept any other suitable response.</p>		
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Q	Answer	Marks	SC
2b	<p>Choose <b>one</b> material from <b>either</b> bamboo, larch, <b>or</b> oak to clad the exterior of an eco-build house. Explain <b>two</b> reasons why you have chosen the material.</p> <p>Award for <b>2 marks</b> for <b>each</b> explanation, up to a maximum of <b>4 marks</b>. Answers must be specific. For example:</p> <ul style="list-style-type: none"> <li>larch is a strong, durable, and visually appealing choice for construction, particularly in applications exposed to the elements. (2) Its cost, potential moisture sensitivity, and availability should be considered. (2) When sourcing larch, ensure it comes from a sustainably managed forest to support environmental responsibility. (2)</li> <li>oak's structural elements are ideal for beams, trusses, and joists due to its strength and durability. (2) It can be used for exterior elements like cladding and decking if properly treated to withstand weather conditions. (2) Oak offers strength, durability, and aesthetic appeal, making it suitable for a variety of construction and design applications. (2) Its higher cost, weight, and sensitivity to moisture are important factors. To ensure sustainability and reduce environmental impact, choose oak sourced from responsibly managed forests, and consider the long-term maintenance requirements. (2)</li> <li>bamboo can be used for beams, columns, and trusses in both residential and commercial buildings. (2) It can be used for roofing materials and exterior cladding, especially in tropical and subtropical climates. (2) Bamboo is a construction material known for its sustainability, strength, and versatility. (2) Its performance can be affected by moisture sensitivity and durability issues if not properly treated. Its availability and regulatory acceptance may also influence its use in different regions. (2) Bamboo is ethically-sourced (2) and must be used in accordance with local building codes and standards. (2)</li> </ul> <p>Accept any other suitable response.</p>	4	3.1.2

Q	Answer	Marks	SC
3a	<p><i>Explain <b>two</b> purposes of a hydrology study.</i></p> <p>Award <b>1 mark</b> for each correct answer, up to a maximum of <b>2 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• use of flood risk management which determines flood patterns and risks to help design flood defences and manage floodplain development (1)</li> <li>• water supply planning, which estimates the availability of water resources to ensure sustainable supply for domestic, agricultural, and industrial use (1)</li> <li>• the use of environmental protection, which assesses how human activities and / or construction projects might impact local water systems, including aquatic ecosystems and water quality (1)</li> <li>• infrastructure development supports the design of dams, bridges, roads, and other infrastructure by understanding how these might be affected by or affect local water systems (1)</li> <li>• climate change impact evaluates how changing climate patterns are likely to alter water availability, quality, and flood risks over time. (1)</li> </ul> <p>Accept any other suitable response.</p>	2	1.3.5

Q	Answer	Marks	SC
3b(i)	<p><i>Identify <b>two</b> objectives of a geotechnical survey during the initial planning stages of a project.</i></p> <p>Award <b>1 mark</b> for <b>each</b> objective, up to a maximum of <b>2 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• soil and rock characterisation (1) (to identify the types of soil and rock present, their distribution, and their physical properties, such as density, moisture content, and grain size)</li> <li>• bearing capacity (1) (to determine the soil's ability to support the weight of a structure without excessive settlement or failure)</li> <li>• foundation design (1) (to provide data that informs the design of foundations)</li> <li>• slope stability (1) (to assess the risk of landslides or slope failure, particularly in hilly or mountainous areas)</li> <li>• seismic analysis (1) (to evaluate how the ground will respond to seismic activity)</li> <li>• groundwater conditions (1) (to understand the groundwater table's location and movement)</li> </ul> <p>Accept any other suitable response.</p>	2	1.3.3

Q	Answer	Marks	SC
3b (ii)	<p>Identify <b>two</b> methods of study in a geotechnical survey.</p> <p>Award <b>1 mark</b> for each method of study, up to a maximum of <b>2 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• site investigation (1) (includes drilling boreholes, digging test pits, and collecting soil and rock samples for laboratory analysis)</li> <li>• laboratory testing (1) (analysing soil and rock samples to determine properties like shear strength, compressibility, and permeability)</li> <li>• field testing (1) (conducting tests like standard penetration tests (SPTs) or cone penetration tests (CPTs) directly on-site to assess soil conditions)</li> <li>• geotechnical reporting (1) (compiling all data and analyses into a report that includes recommendations for foundation design, ground improvement, and any necessary mitigation measures).</li> </ul> <p>Accept any other suitable response.</p>	2	1.3.3

Q	Answer	Marks	SC
3b (iii)	<p>Explain the importance of a geotechnical survey in construction.</p> <p>Award <b>2 marks</b> for an explanation of the importance of a geotechnical survey. For example:</p> <ul style="list-style-type: none"> <li>• it helps mitigate risks by identifying potential geotechnical hazards such as subsidence, landslides, or soil liquefaction, and recommending measures (2)</li> <li>• it ensures design efficiency and provides engineers with critical data that ensures foundations and other structures are designed efficiently and cost-effectively (2)</li> <li>• it ensures regulatory compliance (1) and that construction projects meet local building codes and regulations regarding soil and foundation conditions. (2)</li> </ul> <p>Accept any other suitable response.</p>	2	1.3.3

Q	Answer	Marks	SC
3c(i)	<p>Identify <b>two</b> objectives of a topographical survey in the initial planning stages of a construction project.</p> <p>Award <b>1 mark</b> for each objective, up to a maximum of <b>2 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• elevation data (1) (captures the height of land features relative to a fixed datum, often sea level, showing how the land rises and falls)</li> <li>• contours and terrain (1) (represent the shape and slope of the land, typically shown through contour lines that connect points of equal elevation)</li> <li>• natural features (1) (maps out the locations of trees, rivers, lakes, and other natural landmarks)</li> <li>• man-made structures (1) (includes details of buildings, roads, bridges and other infrastructure)</li> <li>• boundaries (1) (identifies property lines and other legal boundaries important for land ownership and development)</li> </ul> <p>Accept any other suitable response.</p>	2	1.3.2

Q	Answer	Marks	SC
3c(ii)	<p>Identify <b>two</b> methods of study in a topographical survey in construction.</p> <p>Award <b>1 mark</b> for each method of study, up to a maximum of <b>2 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• field surveying (1) (surveyors use tools like GPS, total stations, and levels to measure distances, angles, and elevations directly on-site)</li> <li>• aerial surveying (1) (drones or aircraft equipped with LiDAR (Light Detection and Ranging) or photogrammetry technology capture detailed images and elevation data from above)</li> <li>• geospatial technology (1) (Geographic Information Systems (GIS) is often used to analyse and visualise the data collected, producing detailed topographic maps)</li> </ul> <p>Accept any other suitable response.</p>	2	1.3.2

Q	Answer	Marks	SC
3c (iii)	<p><i>Explain the importance of a topographical survey in construction.</i></p> <p>Award <b>2 marks</b> for a correct explanation of importance. For example:</p> <ul style="list-style-type: none"> <li>• site planning provides crucial information for architects and engineers to design buildings and infrastructure that fit well with the natural landscape (2)</li> <li>• drainage design helps in planning effective drainage systems by showing how water will flow across the land (2)</li> <li>• earthwork calculations assist in calculating the amount of material to be cut or filled during construction, ensuring accurate budgeting and resource management (2)</li> <li>• regulatory compliance: ensures that development projects adhere to local zoning laws and environmental regulations. (2)</li> </ul> <p>Accept any other suitable response.</p>	2	1.3.2

Q	Answer	Marks	SC
4a	<p><i>Identify <b>two</b> different aspects of occupancy comfort.</i></p> <p>Award <b>1 mark</b> for each aspect, up to a maximum of <b>2 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• thermal comfort (1): <ul style="list-style-type: none"> <li>○ temperature (1)</li> <li>○ humidity (1)</li> <li>○ airflow (1)</li> </ul> </li> <li>• acoustic comfort (1): <ul style="list-style-type: none"> <li>○ noise levels (1)</li> <li>○ sound insulation (1)</li> </ul> </li> <li>• visual comfort (1): <ul style="list-style-type: none"> <li>○ lighting (1)</li> <li>○ views (1)</li> </ul> </li> <li>• indoor air quality (1): <ul style="list-style-type: none"> <li>○ ventilation (1)</li> <li>○ pollutants (1)</li> </ul> </li> <li>• ergonomics and functionality (1): <ul style="list-style-type: none"> <li>○ layout (1)</li> <li>○ accessibility (1)</li> </ul> </li> <li>• aesthetic and psychological comfort (1): <ul style="list-style-type: none"> <li>○ design and ambience (1)</li> <li>○ personalisation (1)</li> </ul> </li> <li>• safety and security (1): <ul style="list-style-type: none"> <li>○ safe design (1)</li> <li>○ emergency preparedness. (1)</li> </ul> </li> </ul> <p>Accept any other suitable response.</p>	2	3.3.1

Q	Answer	Marks	SC
4b	<p>Look at the Resource Document. Calculate the average total lumens required for the footprint of <b>Plot 3</b>. You <b>must</b> show your workings.</p> <p>Award <b>1 mark</b> for the correct calculation and <b>1 mark</b> for the correct answer.</p> <ul style="list-style-type: none"> <li>total lumens = 250 lux x 98m<sup>2</sup> (1) (M) = 24,500 lumens (1) (CAO)</li> </ul>	2	3.3.3

Q	Answer	Marks	SC
4c	<p>Look at the Resource Document. The average room height for a private home is 2,400mm. Using the equation: air change per hour = airflow rate (m<sup>3</sup>/h) ÷ room volume (m<sup>3</sup>) Calculate the air change per hour for the footprint of <b>Plot 3</b>. Give your answer to <b>one</b> decimal place. You <b>must</b> show your workings.</p> <p>Award <b>1 mark</b> for the correct calculation and <b>1 mark</b> for the correct answer.</p> <ul style="list-style-type: none"> <li>(volume of room = length x width x height)</li> <li>volume of room = 98m<sup>3</sup> x 2.4m (1) (M) = 235.2m<sup>3</sup> (1) (CAO)</li> </ul> <p>Award <b>1 mark</b> for the correct calculation and <b>1 mark</b> for the correct answer.</p> <ul style="list-style-type: none"> <li>(air change per hour = airflow rate (m<sup>3</sup>/h) ÷ room volume (m<sup>3</sup>))</li> <li>air change per hour = 400 ÷ 235.2 m<sup>3</sup> (1) (M) = 1.7 ACH (1) (CAO)</li> </ul>	4	3.3.3

Q	Answer	Marks	SC
4d	<p>Identify the meaning of <b>each</b> of the symbols in the formula.</p> $U = Q \div (A \times \Delta T)$ <p>You <b>must</b> write your answers in the table below.</p> <p>Where:</p> <ul style="list-style-type: none"> <li>• <math>U =</math></li> <li>• <math>Q =</math></li> <li>• <math>A =</math></li> <li>• <math>\Delta T =</math></li> </ul> <p>Award <b>1 mark</b> for <b>each</b> correct answer, up to a maximum of <b>4 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• <math>U = U\text{-value (W/m}^2\cdot\text{K) (1)}</math></li> <li>• <math>Q = \text{Heat transfer rate (W) (1)}</math></li> <li>• <math>A = \text{Area of the building component (m}^2\text{) (1)}</math></li> <li>• <math>\Delta T = \text{Temperature difference across the component (K or }^\circ\text{C) (1)}</math></li> </ul> <p>Do not accept any other answers.</p>	4	3.3.4

Q	Answer	Marks	SC
5a	<p><i>Explain <b>two</b> advantages of an organogram in a construction project.</i></p> <p>Award <b>1 mark</b> for each explanation, up to a maximum of <b>2 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• clear definition of roles and responsibilities <ul style="list-style-type: none"> <li>◦ clearly outlines who is responsible for what tasks and who reports to whom (1), reduces confusion and ensures that every team member understands their role in the project (1)</li> </ul> </li> <li>• improved communication and coordination <ul style="list-style-type: none"> <li>◦ shows the lines of communication within the project team, making it easier to understand who to contact for specific issues or decisions (1)</li> </ul> </li> <li>• enhanced project management <ul style="list-style-type: none"> <li>◦ project managers can use the organogram to oversee the entire team (1), ensuring that all roles are filled and that the structure supports the project's goals (1)</li> </ul> </li> <li>• facilitates accountability <ul style="list-style-type: none"> <li>◦ it assigns specific tasks and responsibilities to individuals, which makes it clear who is accountable for various aspects of the project (1)</li> </ul> </li> <li>• streamlined decision-making <ul style="list-style-type: none"> <li>◦ by clearly showing the hierarchy and reporting structure, it helps streamline decision-making processes (1) (as it identifies who has the authority to make specific decisions)</li> </ul> </li> <li>• facilitates onboarding / training <ul style="list-style-type: none"> <li>◦ (an organogram) serves as a useful tool for onboarding new team members (1), helping them quickly understand the project structure and their place within it (1)</li> </ul> </li> <li>• transparency and clarity for stakeholders (1) <ul style="list-style-type: none"> <li>◦ provides a transparent view of the project's organisational structure for external stakeholders (such as clients, investors, or regulatory bodies) (1)</li> </ul> </li> <li>• supports risk management (1) <ul style="list-style-type: none"> <li>◦ helps in identifying potential risks related to personnel (such as key positions that lack backup or areas with unclear responsibilities) by clearly defining roles (1)</li> </ul> </li> <li>• adaptability to project changes <ul style="list-style-type: none"> <li>◦ as construction projects evolve, the organogram can be updated to reflect changes in personnel / roles / responsibilities (1)</li> </ul> </li> <li>• efficiency in resource allocation <ul style="list-style-type: none"> <li>◦ helps in visualising the distribution of roles across the full project (1), making it easier to identify where additional resources or adjustments might be needed. (1)</li> </ul> </li> </ul> <p>Accept any other suitable response.</p>	2	2.1.5

Q	Answer	Marks	SC
5b	<p>Identify <b>two</b> fundamentals of a construction design brief.</p> <p>Award <b>1 mark</b> for each comparative up to a maximum of <b>2 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• project objectives and goals (1)</li> <li>• client's needs and expectations (1)</li> <li>• aesthetic considerations and design style (1)</li> <li>• functional requirements (for example, number of rooms, types of spaces) (1)</li> <li>• target audience or end-users (1)</li> <li>• site analysis and context (1)</li> <li>• budget constraints and timeline (1)</li> <li>• environmental and sustainability goals (1)</li> <li>• broad design principles or inspirations (1)</li> </ul> <p>Accept any other suitable response.</p>	2	2.1.1

Q	Answer	Marks	SC
5c	<p>State <b>two</b> ways building information modelling (BIM) is used to appoint and manage an integrated project team.</p> <p>Award <b>1 mark</b> for each response up to a maximum of <b>2 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• facilitate early collaboration (1)</li> <li>• define roles / responsibilities (1)</li> <li>• enhance communication / information sharing (1)</li> <li>• coordinate workflows / integrate teams (1)</li> <li>• support collaborative decision-making (1)</li> <li>• ensure accountability / performance monitoring (1)</li> <li>• facilitate contractual arrangements (1)</li> <li>• enable efficient resource allocation (1)</li> <li>• support ongoing training / development (1)</li> <li>• facilitate continuous improvement / feedback loops. (1)</li> </ul> <p>Accept any other suitable response.</p>	2	2.1.4

Q	Answer	Marks	SC
6a	<p>Name the legislation used to decide if planning permission is required for a <b>new</b> development.</p> <p>Award <b>1 mark</b> for a correct answer. For example:</p> <ul style="list-style-type: none"> <li>• Town and Country Planning Act 1990. (ENGLAND)</li> <li>• Town and Country Planning Act 1997 (SCOTLAND)</li> <li>• Planning and Development Act 2000 (IRELAND)</li> <li>• Planning and Building Law 2002 (JERSEY)</li> </ul> <p>Accept any other response relevant to the country where the exam is being undertaken.</p>	1	2.3.2

Q	Answer	Marks	SC												
6b	<p>Planning permission is a six-stage process Identify the <b>three</b> missing stages in order in the table below.</p> <table><tr><td>Stage 1</td><td>Pre-application advice.</td></tr><tr><td>Stage 2</td><td>Application submission.</td></tr><tr><td>Stage 3</td><td></td></tr><tr><td>Stage 4</td><td></td></tr><tr><td>Stage 5</td><td></td></tr><tr><td>Stage 6</td><td>Implementation.</td></tr></table> <p>Award <b>1 mark</b> for <b>each</b> correct answer in order, up to a maximum of <b>3 mark</b>.</p> <p>Stage 3 = Consultation (1) Stage 4 = Decision (1) Stage 5 = Appeals. (1)</p> <p>Do <b>not</b> accept any other responses.</p>	Stage 1	Pre-application advice.	Stage 2	Application submission.	Stage 3		Stage 4		Stage 5		Stage 6	Implementation.	3	2.3.1
Stage 1	Pre-application advice.														
Stage 2	Application submission.														
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Stage 4															
Stage 5															
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Q	Answer	Marks	SC
6c(i)	<p>Identify <b>three</b> purposes of Building Regulations.</p> <p>Award <b>1 mark</b> for <b>each</b> purpose identified, up to a maximum of <b>3 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• safety (1) (building regulations ensure that buildings are constructed in a way that protects the safety of occupants, including measures to prevent accidents, structural failure and fire hazards)</li> <li>• health (1) (they address issues like ventilation, dampness and hygiene to ensure that buildings provide a healthy living environment)</li> <li>• accessibility (1) (regulations ensure that buildings are accessible to all people, including those with disabilities, by including features like ramps, wide doorways and accessible bathrooms)</li> <li>• energy efficiency (1) (they promote energy efficiency to reduce the carbon footprint of buildings, including standards for insulation, heating and lighting)</li> <li>• environmental protection (1) (building regulations aim to minimise the environmental impact of buildings through sustainable design and construction practices)</li> </ul> <p>Accept any other suitable response.</p>	3	2.3.2

Q	Answer	Marks	SC
6c(ii)	<p>Identify <b>three</b> reasons why you should apply for Building Regulations.</p> <p>Award <b>1 mark</b> for each example identified up to a maximum of <b>3 marks</b>. For example:</p> <ul style="list-style-type: none"> <li>• new buildings (1) regulations apply to the construction of new buildings, ensuring they meet the required standards)</li> <li>• extensions / alterations (1) (when extending or altering existing buildings, the work must comply with building regulations to ensure safety)</li> <li>• material changes of use (1) (if a building's use is changed for example, converting a house into a block of flats, it must meet the regulations applicable to its new use)</li> <li>• renovations (1) (major renovations must comply with relevant building regulations, especially if structural changes or energy efficiency improvements are involved)</li> </ul> <p>Accept any other suitable response.</p>	3	2.3.2

Q	Answer	Marks	SC
6c (iii)	<p>Discuss <b>one</b> impact of <b>non-compliance</b> with Building Regulations.</p> <p>Award <b>2 marks</b> for discussing an impact of non-compliance. For example:</p> <ul style="list-style-type: none"> <li>• legal action: failure to comply with building regulations can result in legal action, fines, and enforcement notices requiring alterations or demolitions (2)</li> <li>• sale issues: non-compliance can also create difficulties when selling the property, as potential buyers may demand evidence that the building meets all regulations (2)</li> <li>• safety risks: non-compliance can lead to unsafe conditions, posing risks to the occupants and potentially resulting in accidents or building failures. (2)</li> </ul> <p>Accept any other suitable response.</p>	2	2.3.2

End of Mark Scheme