



Leaving Certificate Examination, 2003

Construction Studies

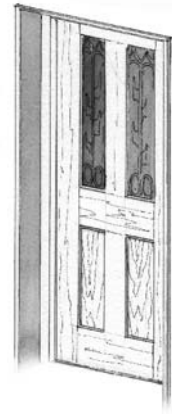
Theory - Higher Level

(300 Marks)

Wednesday 18 June
Afternoon, 2.00 to 5.00

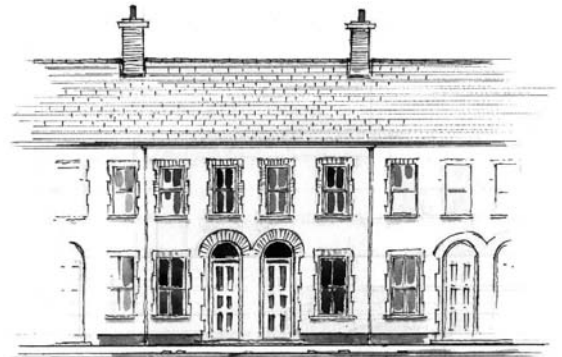
- (a) Answer **Question 1** and **four** other questions.*
- (b) All questions carry equal marks.*
- (c) Answers must be written in ink.*
- (d) Drawings and sketches to be made in pencil.*
- (e) Write the number of the question distinctly before each answer.*
- (f) Neat freehand sketches to illustrate written descriptions should be made.*
- (g) The name, sizes, dimensions and other necessary particulars of each material indicated must be noted on the drawings.*

1. An external wooden door with four panels is shown in the accompanying sketch. The upper panels are glazed and the lower panels are solid. The door opening is located in a standard 300mm external concrete block wall with an insulated cavity. The house has a solid concrete ground floor.



- (a) To a scale of 1:5, draw a vertical section through the external wall and door, showing clearly the threshold, the door and the doorframe. The section should show all the constructional details from 300mm below the bottom of the door to 300mm above the top of the doorframe.
- (b) Indicate on the drawing **two** design details that ensure that moisture does not penetrate to the inner surfaces surrounding the door.
2. A proposed combined kitchen and dining space in a new house is 6m long by 4.5m wide and has two adjoining external walls. This space is to be user friendly for a person in a wheelchair.
- (a) Using a well-proportioned line diagram *or* freehand sketch, propose a design layout for the space, indicating the positions you would choose for the following:
- Doors
 - Sink
 - Storage
 - Electric cooker
 - Windows
 - Work surfaces
 - Fridge
 - Dining table
- (b) Using notes and detailed freehand sketches, outline **two** specific design considerations that would make the proposed layout suitable for a person in a wheelchair.
- (c) Discuss in detail **three** other design considerations that influenced the proposed layout.

3. The sketch shows a terrace of townhouses built over one hundred years ago. It has been decided to carry out essential repairs to one of the houses.



A survey of the house reveals:

- (i) Original natural slate and rafters;
 - (ii) Softwood fascia and soffit;
 - (iii) Original cast-iron rainwater gutters;
 - (iv) Traditional softwood sliding sash windows;
 - (v) Random rubble stone walls with weathered sand/cement render.
- (a) Select **three** areas that may be in need of repair in a house of this age and for **each** of the areas selected give **two** reasons why you consider the repairs may be necessary.
- (b) Describe in detail, using notes and freehand sketches, how **each** of the **three** repairs could be carried out in a manner that would respect the character of the original terrace and that would also ensure that waste is kept to a minimum.
4. Poor design detailing may result in the occurrence of both dry rot and wet rot in a domestic dwelling.
- (a) Outline the conditions necessary for the development of each type of rot.
- (b) Select **one** location in a domestic dwelling where dry rot may occur and, using notes and sketches, show how the rot may be eliminated.
- (c) Using notes and sketches, show the design detailing that would prevent the occurrence of dry rot at the selected location.

5. A dwelling house built in the 1970's has external walls with uninsulated cavities. The owner has decided to insulate the walls of the house. The external walls have the following specification:

Outer leaf: 100mm brick;
 Cavity: 75mm – without insulation;
 Inner leaf: 100mm concrete block with 16mm plaster finish.

Thermal data of wall:

Conductivity of brickwork	(k)	1.320	W/m °C
Conductivity of blockwork	(k)	1.440	W/m °C
Conductivity of plaster	(k)	0.430	W/m °C
Resistance of the external surface	(R)	0.048	m ² °C/W
Resistance of the internal surface	(R)	0.122	m ² °C/W
Resistance of the cavity	(R)	0.170	m ² °C/W.

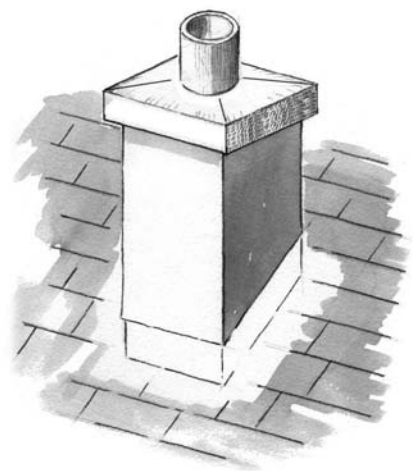
- (a) Calculate the U-value of the wall.
- (b) The owner may choose either of the following methods to increase the insulation properties of the walls:
- filling the cavity with urea formaldehyde foam *or*
 - fixing insulated plasterboard sheeting to the inside wall surfaces. The insulated sheeting consists of 50mm rigid urethane and 12.5mm plasterboard.

Calculate the U-value for each of the above options given the following thermal data:

Conductivity of urea formaldehyde foam	(k)	0.040	W/m °C
Conductivity of rigid urethane	(k)	0.023	W/m °C
Conductivity of plasterboard	(k)	0.160	W/m °C

- (c) Evaluate both methods of insulation listed at (b) above, recommend a preferred method and give **two** reasons to support your recommendation.

6. A concrete block chimney stack with a sand/cement rendering passes through a pitched slated roof, as shown in the sketch.



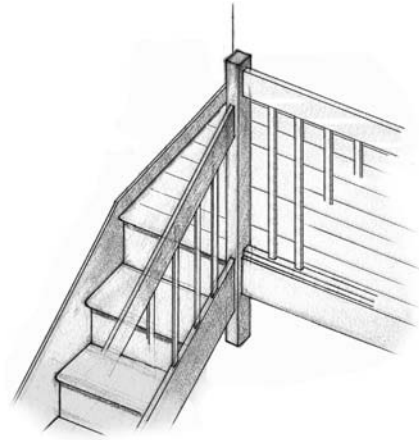
- (a) Using notes and freehand sketches, show the design details necessary to prevent the penetration of water between the chimney stack and the adjoining roof surfaces.
- (b) Poor design detailing may result in the occurrence of a down draught in a chimney. Outline **one** situation in which a down draught might occur and using notes and freehand sketches, show the design detailing that would prevent the occurrence of such a down draught.

7. An oil-fired boiler is used as the heat source to provide central heating and hot water for a domestic dwelling.

- (a) Using a single-line diagram, show a design layout for the heating and domestic hot water system. Include three radiators in the proposed layout and indicate suitable dimensions for all pipework.
- (b) Using notes and freehand sketches, show **three** design details that should be incorporated into the proposed layout to ensure the continuous safe operation of the heating system.

8. A closed string timber stairs leads to a first floor landing, as shown in the sketch. The landing has a suspended timber floor with tongued and grooved flooring boards on timber joists and a plasterboard ceiling beneath.

- (a) To a scale of 1:5 draw a vertical section through the top three steps of the stairs and the landing. Show the newel, balusters and handrail of the stairs.
- (b) Using notes and freehand sketches show the design details necessary to support the stairs at the abutment of the stairs and landing.
- (c) Using notes and freehand sketches show **two** design details that ensure that the landing is safe for all users.



9. A stormproof casement window made from softwood is located in an external wall and provides natural lighting to a kitchen area.

- (a) Describe in detail, using notes and freehand sketches, **two** design details that ensure that the window is weather proof.
- (b) Discuss **two** advantages and **two** disadvantages of using softwood in the manufacture of windows.
- (c) An illuminance of 300 lux is required on a working plane in the kitchen. The daylight factor at a point on the working plane in the kitchen is 5%. Show by calculation if the illuminance is sufficient, assuming an unobstructed view and the illuminance of a standard overcast sky to be 5000 lux.

10. A detached single-storey house is situated adjacent to a main road on the outskirts of a large town and is within easy reach of the town centre. Planning permission is being sought to demolish this house and to erect a four-storey apartment block on the site.

- (a) What arguments might be presented:
 - (i) In support of the erection of the apartment block;
 - (ii) In support of the retention of the existing house?
- (b) Make a recommendation to the planning authority on this proposal and give **three** reasons in support of your recommendation.

OR

“Vernacular styles of buildings exist all over the world. These styles are characterised by their simplicity, by their use of local materials and by the ease with which they can be constructed. The knowledge required for the creation of such buildings was long regarded as common knowledge and freely available to all. The decline of the vernacular tradition with its simple forms and its accessibility to people has resulted in the loss of the knowledge and skills needed to design and construct small buildings, especially the buildings in which people live – their homes.”

Be Your Own Architect (1992) : Peter Cowman.

Discuss.

