



Leaving Certificate Examination 2007

Construction Studies

Theory - Higher Level

(300 Marks)

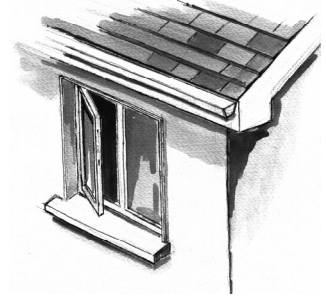
Wednesday, 20 June
Afternoon, 2:00 to 5:00

- (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. The sketch shows portion of a single storey dwelling house having a 300 mm concrete block external wall with insulated cavity. The house has an internal span of 5.0 metres. The window shown is an outward opening double-glazed wooden casement window 1.2 metres in height. The roof, which is slated, is a traditional cut roof pitched at 30 degrees and the ceiling joists are supported centrally on a load-bearing concrete block wall.

- (a) To a scale of 1:10, draw a vertical section through the external wall, window and roof structure. The section should show the typical construction details from 300 mm below the concrete cill, through the fixed frame of the window and include the roof. Show three courses of slate at eaves.

Note: Show the details for one external wall and half the roof including the ridge.



- (b) Indicate on the drawing the design detailing which ensures that moisture does not penetrate to the inner wall at the window head.

2. (a) Identify **two** possible risks to personal safety associated with **each** of the following:

- (i) Slating a steeply pitched roof of a two storey house;
- (ii) Working around a stairwell prior to having the stairs fitted;
- (iii) Placing a ladder against a scaffold.

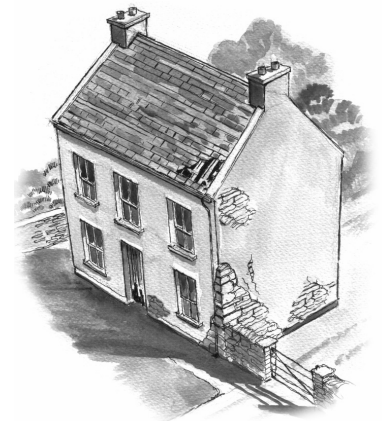
- (b) Using *notes and freehand sketches*, discuss in detail **two** safety precautions that should be observed to eliminate **each** risk outlined at (a) above.

- (c) Discuss in detail **three** reasons that make a construction site a high risk area for accidents at work.

3. A house over 100 years old, in the vernacular tradition, is shown. A survey of the house indicates **three** areas in need of immediate repair:

- **Roof:** traditional cut roof with natural slates;
- **Windows:** single-glazed, painted softwood, sliding sash;
- **External walls:** thick random rubble stone walls with a lime render.

- (a) Describe in detail, using *notes and freehand sketches*, how repairs to **each** area listed above could be carried out in a manner that respects the character of the original house.
- (b) Describe, using *notes and freehand sketches*, how repairs to the roof and windows could be carried out in a manner that ensures the reuse of materials so that that waste is kept to a minimum.



4. A suspended timber ground floor abuts a 300 mm concrete block external wall of a dwelling house.

- (a) Using *notes and freehand sketches* show the construction details of the wall and the suspended timber ground floor from foundation to finished floor level. Indicate clearly the position of a radon barrier and give typical sizes and materials of the floor components.

- (b) Discuss in detail **two** functional requirements of a suspended timber ground floor for a domestic dwelling.

5. (a) Using the following data, calculate the U-value for the external wall of a house, built in the 1970s:

External plaster	thickness	16 mm
Block outer leaf	thickness	100 mm
Cavity (un-insulated)	width	100 mm
Block inner leaf	thickness	100 mm
Internal plaster	thickness	13 mm

Thermal data of external wall :

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

- (b) Using the following data, calculate the cost of the heat lost annually through the un-insulated external wall:

Area of external wall	145 m ²
Average internal temperature	18 °C
Average external temperature	5 °C
U-value of wall	as calculated at (a) above
Heating period	10 hours per day for 42 weeks per annum
Cost of oil	68 cent per litre
Calorific value of oil	37350 kj per litre
1000 Watts =	1kj per second.

- (c) It is proposed to insulate the external walls of the house to improve their U-value. Using **notes and freehand sketches**, show **one** method of insulating the external walls to meet the requirements of the current Building Regulations.

6. (a) Using **notes and freehand sketches**, discuss in detail **three** planning guidelines that should be observed when siting a new house in a rural area to ensure that the house is integrated sensitively into the landscape.

- (b) The accompanying drawing shows a house based on the traditional Irish cottage. The house is designed to have low environmental impact.

Using **notes and freehand sketches**, outline **two** features in the design of the house that reflect a traditional cottage and discuss in detail how **each** feature contributes to reducing the environmental impact of the house.



7. A four-panel wooden door is fixed in the external wall of a two storey timber-frame house, as shown in the sketch. The external wall, which supports the first floor joists, has a concrete block outer leaf with a rendered finish.

- (a) To a scale of 1:10, draw a vertical section through the external wall, door and floor joists. The section should show the typical construction details from 400 mm below the head of the door frame to 400 mm above the first floor joists. Show clearly the external wall, the door, door frame and the first floor joists. Indicate the typical dimensions of **four** main structural members.



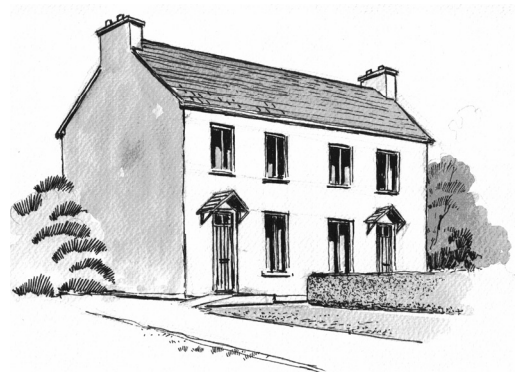
- (b) On the drawing, show clearly how the first floor joists are supported at the timber-frame inner leaf of the external wall.

8. (a) Using *notes and a single-line diagram*, show a typical layout of an oil-fired central heating and hot water system for a two storey dwelling house. Show **three** radiators on each floor, indicate the necessary valves and give typical sizes of the pipework.
- (b) On the diagram, show **two** features that ensure the safe functioning of the heating system.
- (c) Using *notes and freehand sketches*, show **two** details that should be incorporated into the design of the central heating system to ensure the economical use of oil.

9. The accompanying sketch shows two semi-detached houses.

- (a) Using *notes and freehand sketches*, show **two** design details that reduce the transmittance of sound between the two houses and explain the sound insulation principles associated with **each** design detail.

- (b) The first floor consists of tongued and grooved softwood flooring on timber joists with a plasterboard ceiling beneath. Using *notes and freehand sketches*, show **two** design details that would increase the sound insulation properties of the first floor in order to minimise the transmittance of sound.

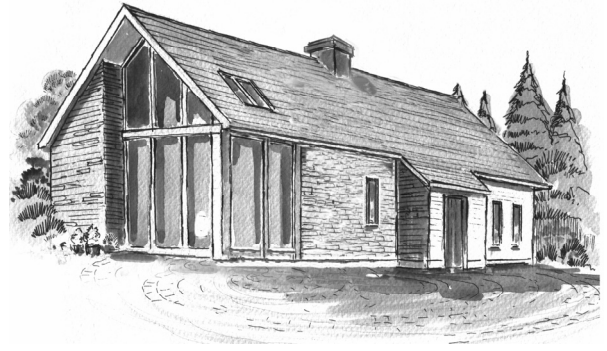


10. A house with an integrated sunspace is shown in the accompanying sketch.

(a) Using *notes and freehand sketches*, show the preferred orientation for the house and sunspace relative to the path of the sun. (*Indicate clearly the direction of North*).

(b) Using *notes and freehand sketches*, propose a layout for the rooms adjoining the sunspace and show how the proposed layout would maximise the benefit of the solar gain from the sunspace.

(c) Using *notes and freehand sketches*, outline **two** design details for the building fabric that would help store the heat gained from the sunspace.



OR

10. “Developing the sustainable neighbourhood is, by its very nature, about much more than higher densities and the choice of a few eco-friendly materials. It involves the integration of economic, community and social sustainability objectives with the physical planning of the neighbourhood. It requires casting these - along with energy use, public transport, recycling, active green space, the hierarchy of streets etc. - into a comprehensive neighbourhood plan”.

*The Sustainable Neighbourhood: by Brian Brennan in
The New Housing: The Royal Institute of Architects of Ireland*

Discuss the above statement in detail and outline **three** recommendations to the planning authorities that would help create better planned sustainable neighbourhoods.

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