



*Leaving Certificate Examination 2006*

# *Construction Studies*

## *Theory - Higher Level*

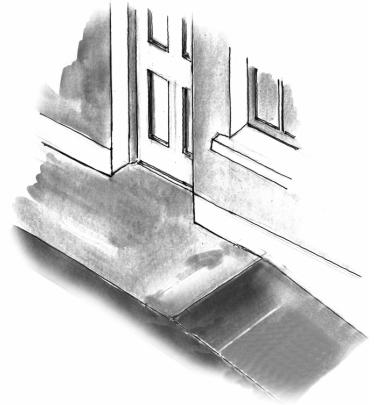
*(300 Marks)*

*Wednesday 21 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.*

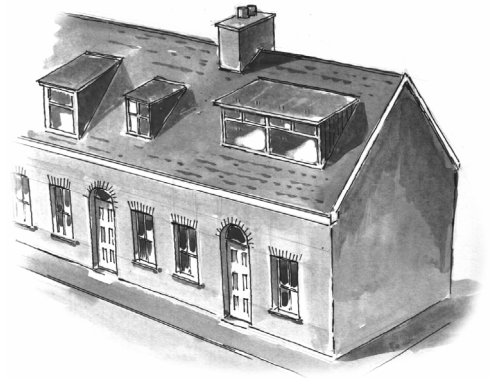
1. The main entrance to a dwelling house, as shown in the accompanying sketch, provides access for a person in a wheelchair. The door opening is located in a 300mm external block wall with an insulated cavity and the door is a solid wooden door. The house has a solid concrete ground floor with a 20mm quarry tile finish.

- (a) To a scale of 1:5, draw a vertical section through the external wall and door, showing clearly the threshold and the door. The section should show all the constructional details from the bottom of the foundation to 300mm above finished floor level.
- (b) Indicate on the drawing the specific design detailing that ensures that rainwater is removed from the threshold area and does not penetrate to the inner surfaces surrounding the door.



2. (a) Identify **two** possible risks to personal safety associated with each of the following:
- (i) Scaffolding;
  - (ii) Deep Excavation;
  - (iii) Use of electrical tools out-of-doors.
- (b) Using *notes and freehand sketches as appropriate*, outline **two** specific safety precautions that demonstrate best practice in order to eliminate **each** risk identified at (a) above.
- (c) Under the Safety, Health and Welfare at Work Regulations, it is compulsory for employers to have a safety statement. Discuss in detail **two** benefits of such a safety statement for employees in the construction industry.
3. It is proposed to provide bedroom accommodation in the attic space of a new house. The house has an internal width of 6.5 metres and the flooring joists are supported internally on a centrally located load-bearing wall. The roof is a traditional cut roof, is slated and has a pitch of 45 degrees.

- (a) Using *notes and detailed freehand sketches*, show the constructional details of the roof structure to facilitate bedroom accommodation in the attic space. Indicate clearly the ventilation **and** insulation detailing of the roof structure.
- (b) The accompanying sketch shows a terrace of townhouses. The dormer windows have been developed in an uncoordinated manner over a number of years. Using *notes and freehand sketches*, suggest a revised design for the dormer windows that would improve the visual appearance of the houses and enhance the character of the terrace.



4. Investigations indicate that a site on which a house is to be built has a moderately firm clay subsoil. Consideration is being given to using either a traditional strip foundation **or** a raft foundation.
- (a) Show, with the aid of *notes and freehand sketches*, the design detailing for **each** type of foundation listed above. Indicate typical dimensions for each foundation.
- (b) Recommend **one** of the above foundation types for the house and give **two** reasons in support of your recommendation.
- (c) Identify **two** factors that could adversely affect the strength of concrete in a foundation.

5. The external wall of a timber framed house has the following specification:

|                            |           |         |
|----------------------------|-----------|---------|
| External Plaster           | thickness | 15 mm   |
| Block outer leaf:          | thickness | 100 mm  |
| Timber stud inner leaf :   | thickness | 125 mm  |
| Urethane board insulation: | thickness | 100 mm  |
| Plasterboard:              | thickness | 12.5 mm |

**Thermal data of outer leaf :**

|                                     |     |                           |
|-------------------------------------|-----|---------------------------|
| Resistance of the external surface  | (R) | 0.048 m <sup>2</sup> °C/W |
| Resistivity of the external plaster | (r) | 2.170 m °C/W              |
| Conductivity of block               | (k) | 1.320 W/m °C              |

**Thermal data of inner leaf :**

|                                    |     |                           |
|------------------------------------|-----|---------------------------|
| Conductivity of urethane board     | (k) | 0.023 W/m °C              |
| Conductivity of plasterboard       | (k) | 0.160 W/m °C              |
| Resistance of the internal surface | (R) | 0.104 m <sup>2</sup> °C/W |
| Resistance of the cavity           | (R) | 0.170 m <sup>2</sup> °C/W |

*Ignore the timber studs of inner leaf.*

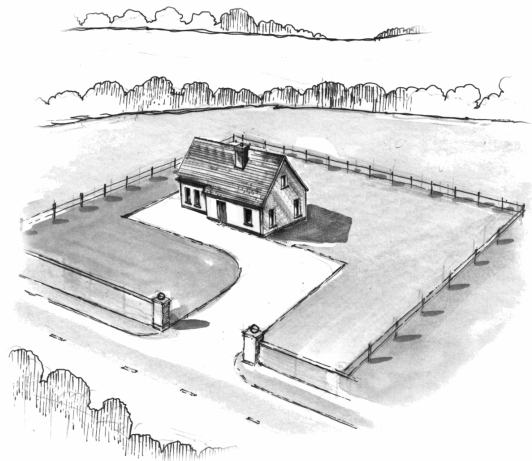
- (a) Calculate the U-value of the wall.
- (b) Calculate the annual cost of the heat loss through the external wall of the timber framed house outlined above, using the following data:

|                               |                                         |
|-------------------------------|-----------------------------------------|
| Total external wall area:     | 125 m <sup>2</sup>                      |
| Average internal temperature: | 18 °C                                   |
| Average external temperature: | 6 °C                                    |
| U-value of wall:              | as calculated at (a) above              |
| Heating period:               | 12 hours per day for 40 weeks per annum |
| Calorific value of oil:       | 37350 kj per litre                      |
| Cost of heating oil:          | 65 cent per litre                       |
| 1000 Watts =                  | 1 kj per second.                        |

- (c) Show, with the aid of *notes and freehand sketches*, a design detail which will prevent moisture reaching the insulation material from inside the building.

6. Many local planning authorities provide guidelines outlining good practice to be followed when locating a dwelling house in the countryside.

- (a) Discuss in detail **three** planning guidelines that you consider should be observed when locating a dwelling house in the countryside.
- (b) The accompanying sketch shows a newly built house in a rural setting. Using *notes and freehand sketches*, outline in detail **two** proposals that would minimise the visual impact of the newly built house and thus help integrate the house into the landscape.



7. (a) To a scale of 1:10, draw a vertical section through the window, the external wall and the roof of a timber-framed house, as shown in the sketch. The external leaf is of concrete block construction with a rendered finish. The roof has prefabricated trussed rafters, is slated and has a pitch of 45 degrees. Show all the constructional details from 300mm below the window head, through the eaves and include three courses of slate.
- (b) On the drawing, label and indicate the typical dimensions of **four** main structural members.



8. A single stack system is commonly used to discharge soil and waste from a domestic dwelling.
- (a) Show, with the aid of *notes and detailed sketches*, a typical layout of a single stack system for a bathroom, situated at first floor level of a dwelling house. Show **two** design considerations relating to the location of the bathroom fittings and include the typical sizes of all waste pipes.
- (b) Using *notes and freehand sketches*, show **two** design details that ensure the pipework in an underground drainage system is watertight.
- (c) Using *notes and freehand sketches*, outline **one** test that may be carried out on an underground drainage system to determine if the pipework is watertight.

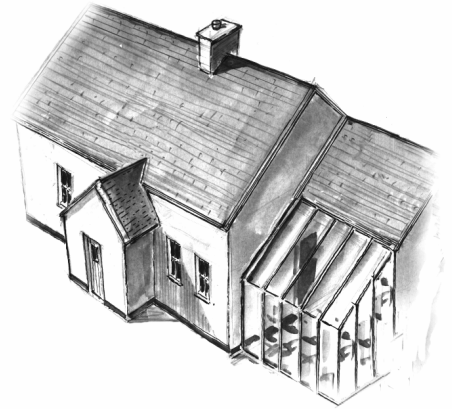
9. The accompanying sketch shows two semi-detached houses.

- (a) Using *notes and freehand sketches*, show **two** design details that would help restrict the spread of fire between the houses.
- (b) Using *notes and freehand sketches*, show **two** design details that would facilitate escape from a domestic dwelling in the event of an outbreak of fire.
- (c) A smoke detection system is compulsory in all new residential dwellings. Outline **two** considerations to be observed when fitting a smoke detection system in a house.



10. In order to maximise passive solar gain, a fully-glazed sunspace is included in the design of the house shown in the accompanying sketch.

- (a) Using *notes and freehand sketches*, outline **two** considerations that should be taken into account when incorporating a fully glazed sunspace into a dwelling house.
- (b) Using *notes and freehand sketches*, show your preferred orientation for the house and sunspace shown. Outline **two** reasons to support your choice of orientation.  
(Indicate clearly the direction of North).
- (c) Using *notes and freehand sketches*, outline **two** considerations in the design of the house that would help maximise the solar gain from such a sunspace.



**OR**

“The sustainable neighbourhood is, in many respects, based on the traditional urban neighbourhoods common in cities over many centuries. The pattern has numerous advantages over that of suburban sprawl. It involves much less car dependence for daily tasks and can be much more easily served by effective public transport”.

*Housing in Ireland: Performance and Policy  
National and Economic Social Council (NESC)*

Discuss the above statement in detail and outline **three** recommendations to the planning authorities which would create better planned urban neighbourhoods and reduce dependency on the private car.

BLANK PAGE

BLANK PAGE

BLANK PAGE