



Pre-Leaving Certificate Examination, 2011

Construction Studies

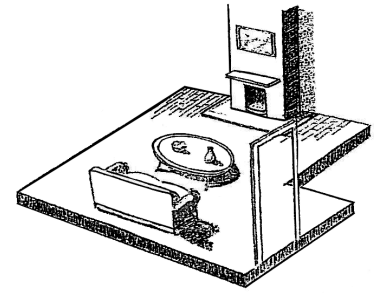
Theory - Higher Level

(300 marks)

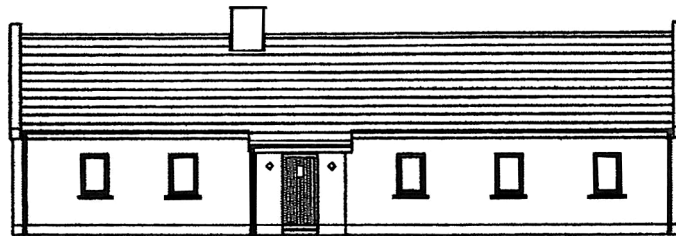
Time: 3 Hours

- (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 an open fireplace located on an external wall in a domestic dwelling. The external wall is a 350 mm concrete block wall with an insulated cavity and is supported on a traditional strip foundation. The house has a solid concrete floor with hardwood timber flooring.



- (a) To a scale of 1:5, draw a vertical section through the ground floor, hearth and fireplace. The section should show all the construction details from the bottom of the foundation to the top of the first flue liner. Include **four** typical dimensions on your drawing.
- (b) Indicate clearly on the drawing **two** design details that would prevent downdraught in a chimney.
2. It is proposed to design and build a new bungalow for a person in a wheelchair, as shown by the accompanying sketch.



- (a) Using notes and *freehand sketches*, outline any **three** areas that need specific consideration to ensure suitability for a person in a wheelchair.
- (b) Select **one** of the areas outlined at (a) above and, using notes and *freehand sketches*, show **three** specific design considerations to ensure that it is suitable for a person in a wheelchair. Indicate on your design sketches typical dimensions as appropriate.
3. A small rural dwelling house constructed in the 1960s is shown in the accompanying sketch. A survey has revealed the presence of rot on the joists and rafters at the eaves. The survey has also revealed the presence of dampness on the walls.

- (a) Discuss, using notes and *freehand sketches*, **two** possible causes of rot at the eaves of the dwelling house.
- (b) Describe, using notes and *freehand sketches*, the correct design detailing that would prevent the occurrence of rot in the dwelling house.
- (c) The presence of dampness in the walls may be as a result of condensation. Outline the possible causes of condensation in buildings and discuss, using notes and *freehand sketches*, the remedial measures that could be taken to prevent the formation of condensation.



4. A new extension has been constructed to a dormer bungalow to provide additional space for a new bathroom as shown in the sketch. The new extension has a solid concrete floor with a tiled finish. The existing bungalow has a suspended timber floor.



- (a) To a scale of 1:10, draw a vertical section through the external wall and the ground floor showing both floor constructions. The section should show all the construction details from below the foundation to above finished floor level and include the abutment of both floors.
- (b) Indicate clearly on the drawing a method of providing cross-ventilation between the two floors.
5. It is proposed to improve the thermal efficiency of a dwelling house by installing triple-glazed windows.

- (a) Calculate the U-value of the new triple-glazed windows given the following data:

Glass: triple-glazing	thickness	5 mm
Space between panes	width	8 mm

Thermal data of glazing:

Conductivity of glass	(k)	1.02 W/m °C
Resistance of space between panes	(R)	0.15 m ² °C/W
Resistance of internal surface	(R)	0.12 m ² °C/W
Resistance of external surface	(R)	0.08 m ² °C/W

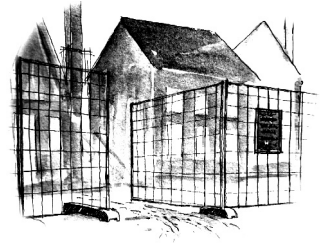
- (b) Using the thermal data below and the U-value obtained at 5(a) above, calculate the cost of the heat lost annually through the new triple-glazing in the dwelling house:

Thermal data:

Area of triple-glazing	42 m ²
Average internal temperature	18 °C
Average external temperature	6 °C
U-value of triple-glazing	as calculated at 5(a) above
Heating period	9 hours per day for 38 weeks per annum
Cost of oil	73 cent per litre
Calorific value of oil	37350 kJ per litre
1000 watts	1 kJ per second

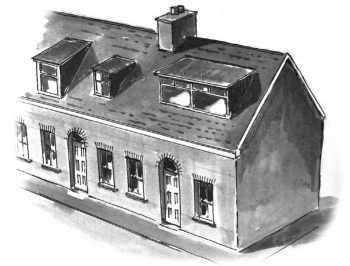
6. Poor planning during the Celtic Tiger years has led to many unfinished and unoccupied developments in urban areas.

- (a) Discuss in detail, using notes and *freehand sketches*, **three** planning guidelines that should be observed to avoid inappropriate development in urban areas in the future.
- (b) Describe in detail how you would submit a planning application, making reference to all the legal documents required.
- (c) Explain, in terms of planning, what is meant by each of the following:
 - outline planning permission;
 - retention.



7. A terrace of townhouses is shown in the accompanying sketch. With dwellings located in such close proximity, the transmission of sound is of particular concern to the residents.

- (a) Using notes and *freehand sketches*, show **two** design details that would limit the transmission of sound between the houses.
- (b) Discuss any **two** sound insulation principles which would influence your design details.
- (c) The terrace is located close to a main road. Discuss how you would improve the sound insulation properties of the terrace with specific reference to traffic noise.



8. A wood-burning stove fitted with a back boiler is used to provide central heating and hot water in a two-storey dwelling house.

- (a) Using notes and a *single-line diagram*, show a design layout for the pipework necessary to provide central heating and hot water in the dwelling house. Show **three** radiators on each floor.
- (b) Indicate clearly on your diagram **three** valves necessary to ensure the safe functioning of the central heating system and write a short note explaining the function of each.
- (c) Outline **three** design details that should be incorporated into a central heating system to ensure the economical use of fuel.



9. Correct construction of the upper floors of a dwelling house plays a significant role in making a building structurally sound.
- (a) Using notes and *freehand sketches*, show the layout of joists to accommodate a stair opening in an upper floor. The stairwell is located on an external wall of the dwelling house.
 - (b) Using notes and *freehand sketches*, show the correct design detailing required for the following:
 - trimmer joist to trimmed joist
 - joist to external wall.
 - (c) Describe the precautions that should be observed to ensure the safety of workers prior to the installation of the stairs.
10. A garage adjoining a dwelling house is to be converted into additional living space for a family. The garage was constructed with 225 mm solid blockwork, has a pitched roof and single-glazed timber windows.
- (a) Using notes and *freehand sketches*, show clearly how the thermal performance of the room conversion can be improved.
 - (b) Identify **two** possible air leakage routes in the room conversion. Using notes and *freehand sketches*, show clearly the correct design detailing that will improve the airtightness at each air leakage route identified.
 - (c) Describe a test that can be used to determine the airtightness of the room conversion. Outline **two** advantages of improved airtightness in the new living space.

OR

10. “The form, material and construction methods of older buildings illustrate the ecological adaptation of rural society to its varied environments and closely reflect traditional, economic and social structures. Newer buildings reflect the rapid pace of recent social changes in the countryside, many showing a sharp break with earlier forms and building materials and lacking regional distinctiveness.”

Atlas of the Irish Rural Landscape, 2nd edition
Cork University Press, 2009

Discuss the above statement in detail and propose **three** guidelines that would help create environmentally sustainable housing in rural Ireland.

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